GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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VOL. CLXXXIV. No. 3422.] WEDNESDAY, DECEMBER 19, 1928. [80TH YEAR.

The Season's Greetings to our Readers.

Dry Coke: In Britain—

Two important papers on the dry cooling of coke, in this country and in America, are published in to-day's issue of the "JOURNAL;" and as both are concerned with the Sulzer plant, they constitute an interesting comparison. Moreover, they appear at a time when the gas industry should be making a determined effort to translate into practice its previously expressed ideals of a good coke service. In no carping spirit we suggest that until comparatively recently gas undertakings generally showed lack of enterprise and lack of responsibility in this particular, in spite of the fact that in many instances coke was—as it still remains—the backbone of the gas business. In these columns only a fortnight ago we contrasted the attention which is given to gas sales with that which is paid to the production and marketing of coke—a product which is responsible for a vast amount of revenue, and has an extremely important bearing on the price at which consumers can be supplied with gas. That article, which appeared in the "JOURNAL" for Dec. 5, was the outcome not of sudden inspiration, but of prolonged misgiving that once again our elastic industry would await the spur of competition before exercising the whole of its inherent energy in an enthusiastic effort to satisfy the legitimate demands of coke consumers—be the latter large or small, domestic or industrial. However, pessimism gives place to optimism when we read about Burnley's courageous enterprise.

The story of what the Burnley Corporation Gas Department has accomplished was told by the Engineer and Manager, Mr. J. H. Clegg, in a contribution to the proceedings at a meeting of the Manchester District Institution of Gas Engineers on Friday last. Our readers, of course, are aware that the erection of a Sulzer coke cooling plant was completed at the Oswald Street Works of the Department early this year; and we have no doubt there has been much conjecture concerning the practical results of the comparatively large capital outlay on such a plant. Probably there have been sceptics; but we think that the latter will have to modify their views after studying Mr. Clegg's paper. The Sulzer plant at Burnley, which, erected by skilled Swiss labour, is constructed practically throughout of British material, was put to work in February last, has a cooling capacity of 120 tons of coke per 24 hours, and a guaranteed output of 840 lbs. of steam per ton of coke treated. The latter is the makers' figure, and working results have shown it to be conservative. The entire plant is in duplicate, so that at no time will it be necessary to resort to wet quenching. Naturally the author devotes a considerable portion of his paper to a description of the plant and its operation. With regard to the plant itself, it is interesting that accumulator locomotives are employed, which are charged periodically with steam at 160 lbs. per sq. in., and on each charge are able to perform six to eight hours' work in moving coke skips from chute to chute. As to the operation of the plant, Mr. Clegg's remarks are of great practical value—particularly those concerning the formation of an explosive mixture in the coke container, due either to uncarbonized coal or to leakage of steam from the superheater tube.

In the "JOURNAL" article to which reference has been made, while recognizing the importance of marketing coke of high quality, we suggested that uniformity of supply is of as high a value as is standard of quality; and it is in this respect, we think, that the Sulzer plant shows to such great advantage. The process involves greater handling of the coke than is the case with wet quenching. This has been considered in certain quarters as a drawback; but there can be little question that the product, being thus rendered more resistant to further handling, arrives at the point of consumption in a more uniform condition. The latter, we maintain, is a definite advantage. The other chief superiority mentioned by Mr. Clegg is that he can sell more dry coke than is available either for shipment abroad or for inland use, at a price greater by 2s. 6d. per ton than that of wet-quenched coke—a fact which counteracts the purely fictitious gain (because it must be a temporary one) of selling water at the price of good fuel.

And in America.

WE have called attention to a further paper on dry coke cooling which is published in our columns to-day. This is a contribution by Mr. D. W. Wilson, Vice-President of the Dry Quenching Equipment Corporation of New York, to the Second International Bituminous Coal Conference which took place in Pittsburgh last month. The Sulzer plant he describes is installed at Rochester, New York; and, basing his observations on the working results of this unit, he proceeds to give the costs and the revenues (steam only) to be expected in a plant handling 3300 tons of coke a day. He estimates the cost of installation of such a plant at £108,470, and fixes the annual charges at 16 p.ct. Including the latter, he arrives at a total cost of steam of 5¾d. per 1000 lbs. The operating data he employs as a basis for his conclusions are of a unit four times the size of that erected at Burnley; and it is significant that his figure of 74·6 p.ct. for the steam-raising efficiency is practically the same as that found by Mr. Clegg—75·7 p.ct.

Both authors compare the dry coke with ordinary wet-quenched coke. Mr. Wilson states that, for water gas production, the dry product shows a 5 p.ct. greater economy, which may in part be due to the absence of moisture and the consequent extension of the reducing

zone in the generator, but which, to our mind, is more likely the outcome of greater uniformity in size and greater physical strength. Similar economies have been demonstrated when the dry coke has been employed in producers. For foundry work, where large coke is often desirable, the dry fuel from the Sulzer plant is at a disadvantage, though its other favourable features may easily offset this. As for domestic purposes, the consumer realizes that he is paying for fuel, not for water, and he appreciates the good appearance and the cleanliness of dry coke. Regarding this matter, Mr. Clegg includes in his paper an interesting series of analyses of different cokes. A carefully quenched horizontal coke contains 8·6 p.ct. of moisture. This compares with 3·9 p.ct. for a typical low-temperature product, 1·2 p.ct. for a non-steamed vertical coke, and 0·1 p.ct. for the fuel cooled in the Sulzer plant. At the same time, Mr. Clegg has discovered that the dry coke is more difficult to ignite than is the wet-quenched product; and in view of this surprising result, he intends to conduct experiments to render the dry coke as readily ignitable as is low-temperature solid fuel.

Finally, considering what is really the most important point of both contributions—whether the dry cooling process is worth while as a paying proposition—we believe that, though such plant may not show substantial profit to-day, its adoption will be regarded in a much more favourable light as the public become enlightened about the virtues of a carefully prepared coke, and consequently more fastidious in their tastes and more exacting in their demands. There is need for intensive propaganda regarding the economy, efficiency, and cleanliness of good gas coke; and there is equal need for better organization of its sale. The effect of coke sales on the price of gas is not sufficiently appreciated; otherwise greater attention would be paid to the subject. We must take the long view in the matter of coke sales; what may be good enough to-day will quite definitely be inadequate in the near future, when intensive competition will inevitably have resulted in the formulation of a higher standard of coke service. The Burnley Corporation Gas Committee showed courage when they decided to instal a duplicate dry cooling plant, at a cost of £21,600, when an alternative scheme was available at half the capital outlay; but bearing in mind Mr. Clegg's statements that the installation has saved the labour of three men formerly employed for steam raising, has cut-down the quenching water bill by £300 per annum, has greatly extended their market for a coke which can be sold at an enhanced price, has reduced their breeze production by 5 p.ct. (which is equivalent to £750 per annum), will undoubtedly decrease corrosion charges on the carbonizing plant as a whole, and will with equal certainty heighten the public's appreciation of, and satisfaction with, the Burnley coke service, we cannot think that there are many gas engineers who will maintain that this courage was rash.

Comfortable Lighting.

LAST Saturday Mr. H. J. Hodsman, M.B.E., M.Sc., F.I.C., of the Department of Coal Gas and Fuel Industries of the Leeds University, addressed a meeting of the Yorkshire Junior Gas Association on the subject of gas lighting, concentrating attention on the radiation of heat from gas lighting burners. His observations, which are published *in extenso* in later columns of our issue to-day, are more than welcome, for at least two reasons. In the first place, the author, by setting out the results of an investigation which he carried out jointly with Mr. H. H. Thomas, B.Sc., who is now a member of the chemical staff of the Liverpool Gas Company, has made available new and important information on an obscure and wrongly neglected subject. Secondly, his remarks appear at a time when an attempt is being made to arouse the industry generally to a truer conception of the value of the lighting load, and of the folly of disregarding it. Two things are needed immediately—abundant faith in the virtues of gas as an illuminant, and unremitting energy to prove—as it most certainly can be proved—that this faith is more than justifiable. Every gas undertaking that has made a determined effort to retain the major portion of its lighting load, and to recapture that which, through inattention, has temporarily been lost, has met with great success. Nor is this success in the least astonishing, for gas lighting has two outstanding qualities, apart entirely from that of cheapness. It is comfortable to the eye, and in many cases it is comfortable to the body.

It is on the heat comfort of gas lighting that Mr. Hodsman dwells. He demonstrates how much of the heat developed in the gas mantle may be radiated to the surrounding space, thereby contributing to the warming of the apartment in which the illuminating burner is placed. The heat radiation may be of little use in the dwellings of the wealthy, but it means a great deal to the ordinary class of consumer, and is of the utmost importance to the prepayment customer. And while thinking of the latter—a class which bulks so largely in the total people supplied by any gas undertaking—we must bear in mind also that the heat of a gas mantle sets up intensive convection currents in the air of the room; and these constitute a decided hygienic advantage. If, then, the industry concentrates merely upon two of the characteristics of gas lighting—light comfort and heat comfort—and each undertaking organizes an efficient maintenance system which convinces all consumers that good service is no idle theoretical dream on the part of the industry, success is assured. We know of gas concerns which, in areas enjoying very cheap electric current distributed with a view to increased demand, have positively revolutionized their lighting business. Their optimism has been rewarded for the simple reason that faith in gas as a present-day illuminant is not ill-founded.

There is another point, equally important—a point which may be in the nature of a platitude, but which we have no fear in emphasizing, because its value is not yet properly assessed. A good lighting service renders the consumer so satisfied with gas that inevitably the other applications, cooking and heating, are more appreciated; and an otherwise small demand develops into proportions which make the prepayment consumer a paying asset, instead of a nebulous gain, to the supplying undertaking. In other words, good gas lighting spells increased goodwill; and this in turn implies a greater and more permanent demand.

Speaking of the decline of interest in the scientific study of gas lighting problems in recent years, Mr. Hodsman suggests that it is a mistake. We thoroughly agree, for there is little doubt that gas is peculiarly adapted to meet the requirements of many definite fields. The illumination of streets and public places affords a striking example, and the lighting of the dwellings of those whom Plutus has not taken by the hand is another instance. Mr. Hodsman's address, of course, is confined to the latter field. He describes attempts made to see how far the downward radiation from a gas lighting burner could be increased, and mentions that when the top of the burner was lined by a refractory magnesia cement, the radiant efficiency was increased to exceed 30 p.ct. Indeed, without the globe it reached 37 p.ct., thus approaching the efficiency of a gas fire. The figure for a three-light cluster burner with superheater was 29 p.ct., and this was increased to 32 p.ct. by placing a simple disc of tinplate over the burner. We may well echo the concluding remarks of the address: These figures bear out the contention that the useful heating effect of the gas lighting burner is by no means negligible, and suggest that there is scope for some increase by suitable design.

An Unsurpassed Service.

As we have said, dual-comfort service can be obtained—lighting to a degree unsurpassed by any other method of illumination, and warmth to a considerable extent—from the incandescent gas mantle, which also ventilates as it lights and warms. A public servant of immeasurable value this—and one which demands but small wages, and is not extravagant in cost of maintenance. Little wonder that it has so many friends! Its champions are to be found everywhere; and some of them are now testifying to its merits in our "Correspondence" columns. We are glad to see this testimony; for it affords confirmation of the view that, under the best conditions, gas can meet all the needs of the community. And the cost? Here is a statement made by a correspondent last week: "With the

"average price of gas, 1d. gives five hours' light of "some 50 to 60 candle power, and serves not only as an "illuminant, but warms and ventilates the room." In what other direction can one seek a triple service of this usefulness, at an outlay of less than a farthing an hour? The second service—that of providing warmth—is an exceedingly important consideration in a climate which provides so many chilly mornings and evenings, when very little heat will banish all that sense of discomfort which is otherwise inevitable. Many years ago gas consumers realized how easy it was to secure just this little extra warmth; and, as the same correspondent has pointed out, the need for it is even greater now than it was before the war, for the modern house is probably of thinner wall structure, and more often either detached or semi-detached.

At times like the present, when money is scarce, the cheapness and other advantages of gas lighting make it more than ever desirable; and we repeat that it behoves the industry to utilize these advantages to the utmost. Some of the means of carrying on a lighting campaign were indicated by our correspondent last week; the first being the arrangement of special lighting windows at the showrooms. Without loss of time, a subsequent correspondent indicates in to-day's issue, by means of a photograph, what he has done in this direction; and certainly he has done it very well. In addition to this step, it is recommended that consumers should be notified, by means of a pamphlet delivered with the quarterly accounts, of the possibilities existing; and there should be notices in the Press indicating the lighting facilities offered by the undertaking. There is material here for a "long, long pull, and a strong, strong pull," which should make gas lighting "go" in any district in which it may not be going sufficiently well at present. As an incentive to the starting of such a campaign, we would repeat the statement of yet another correspondent, that electricity "gets in through lighting, and it can be kept out by lighting."

National Fuel and Power Committee.

The invitation which was received by the National Gas Council to nominate two representatives to serve upon the Committee appointed by the Government to deal with the question of "gas grid" schemes was fully appreciated by the industry; and there has been a good deal of interest felt regarding the selection of these members. All speculation on the matter is set at rest by the announcement contained in the report of the last meeting of the Central Executive Board to the effect that Mr. Thomas Hardie and Mr. Samuel Tagg had been invited, and had agreed to accept, the nomination of the National Gas Council. The selection is an excellent one for an inquiry of the nature of that which is in contemplation.

Deserved Acknowledgment.

There were pleasing announcements in connection with the last meeting of the Council of the Institution of Gas Engineers, the proceedings at which are reported on another page of this issue. The first of these was a well-deserved acknowledgment (in the form of an honorarium of £50 and an increase in salary) made to Mr. J. H. Winder in consideration of the extra duties that he had to undertake in consequence of the illness of Mr. Dunn, and in the period up to the appointment of the new Secretary. Every member who is in the habit of attending the annual meetings of the Institution knows Mr. Winder, and will be pleased to hear of this material recognition of his services. Equally general satisfaction will be felt at the decision to raise a testimonial fund to show the appreciation of the members of the good work performed by Mr. Walter T. Dunn during his long period of office as Secretary. Contributions are limited to a modest sum, and if Mr. Dunn gets his deserts not a single member's name will be absent from the list of subscribers.

Efficient Salesmanship.

No one will deny that, as Chairman of the Committee set up to consider the problem of education for salesmanship, Mr. F. W. Goodenough is in a position to express authoritative opinions on this vital subject; and therefore earnest heed should be paid to his view that the great need of our country at this juncture in its history is increased efficiency in the marketing of its goods, which has not kept pace with the increase in recent years in our efficiency in production—too many manufacturers believing that a first-class article will practically sell itself. If further evidence of the prevalence of this mistaken belief be needed, it will be found in a report (dealt with editorially in last week's issue of the "JOURNAL") published by the Department of Overseas Trade on the conditions and prospects of British trade in India. This report was prepared by the Senior Trade Commissioner in that country, who is of opinion that the need for improved marketing systems lies at the heart of the British trade position to-day in India; and there is, of course, no reason to suppose that, if this be true of India, it is not equally so of other places. The report is one which we commended to the close attention of British manufacturers engaged in export trade; and, along with it, we would now urge attentive study of an address (reported later in this number) delivered by Mr. Goodenough to the Midland Branch of the Sales Managers' Association.

Loss of Pressure in Meters.

The importance of this question has not been diminished by the appearance of the high-capacity meter, which rightly is being adopted in ever-increasing numbers. Referring to the subject in an address before the Midlands Gas Salesmen's Circle last month, Mr. R. J. Rogers, the Superintendent of the Fittings Department of the Birmingham Corporation Gas Department—who more than fifteen years ago emphasized the need for small meters of large capacity—said that he regards it as unfortunate that the manufacturers have adopted the method of badging them on a maximum output basis; and he urged that care should be taken by those who fix these meters to ensure that they are not fitted in positions where they will always be working at the maximum capacity as marked on the particular meter. He pointed out that at this capacity the loss of pressure between inlet and outlet should not be more than two-tenths. How often, we wonder, is this true? It has to be borne in mind that, when the badged capacity is exceeded, the pressure loss increases. Moreover, a meter of such size should be installed that, though it will cope satisfactorily with the maximum load—*i.e.*, when all the appliances on the premises are in operation simultaneously—the average load is well below the badged capacity. It seems reasonable, therefore, that the meter should be badged at the average demand capacity.

Big Steel and Coal Mergers

A considerable amount of interest was aroused by an announcement made by the "Financial Times" on Friday last, to the effect that the firm of Bolckow Vaughan & Co. have been negotiating with Dorman, Long, & Co. for a fusion of interests, and that negotiations for a working agreement between Vickers-Armstrong and Cammell Laird are near completion. The first two Companies have large steel and coal interests, with a united outstanding share and loan capital of over £20,000,000, while the capital involved in the Vickers-Armstrong proposal is £22,500,000. The Cargo Fleet Iron and South Durham Steel Companies, whose total capital is about £2,700,000, have already agreed upon an amalgamation. It is understood that at the present time Dorman Long's combined plant has an annual productive capacity of about 2,000,000 tons of pig-iron and approximately 1,500,000 tons of finished steel. This week full details have become available of the scheme for the co-ordination of interests between Vickers, Vickers-Armstrong, and Cammell Laird & Co. The agreements entered into are confined to the railway carriage and wagon and steel interests. The other activities of the Companies concerned are not affected. The steel interests will be taken over by the English Steel Corporation—a Company recently formed—and the wagon branch will be transferred to the Metropolitan Carriage Waggon and Finance Company (the title of the latter being changed).

ON THE ELECTRICAL SIDE.

Nuisance Caused by a Generating Station.

An important judgment was delivered in the Court of Appeal a few days ago, when it was decided, by a majority of the Lords Justices who had heard the arguments, that the Manchester Corporation should be restrained from committing a nuisance by their generating station. The action was brought by a farmer at Barton-on-Irwell; and it raised a point which may prove to be of far wider application than as between merely the two parties immediately concerned in it—namely, whether occupiers of property in the neighbourhood of electricity generating stations erected under parliamentary powers possess any legal remedy for a nuisance caused to them or to their property. Seeing that the nuisance consisted of the emission from the well-known Barton generating station of sulphur and sulphur compounds, it is easy to understand the desire of a farmer to secure an injunction which would put a stop to a free distribution of this character, to the detriment of his land. The Manchester Corporation, it seems, admitted the nuisance complained of, but took refuge behind their statutory powers; and this defence availed them when the case was first tried, at the Manchester Assizes. On that occasion, judgment was given for the Corporation (but without costs); it being held that the station was of a kind which Parliament had authorized to be built there, and that no means which science and knowledge could suggest would have avoided the nuisance complained of.

Statutory Powers No Protection.

The farmer's objection to this emission of sulphur and sulphur compounds was, however, so strong that he felt disinclined to submit to its continuance without a further struggle; and so the case was taken to the Court of Appeal, with the result, as already stated, that by a majority of two to one judgment was given against the Manchester Corporation. Lord Justice Scrutton, in the course of his judgment, said it was clear that the station, "in using the coal which it did, discharged such a quantity of sulphur that the fumes, which were mixed with moisture, were not dispersed in the atmosphere," but descended on the land. The importance of the question, he went on, arose from the fact that large generating stations were being erected, and were likely to be erected, on agricultural land. It appeared to be clear that within their own area the Manchester Corporation were liable for damage by nuisance; but it was argued that they were not liable outside their area, because their powers were obtained by a Private Act. The Judge could see no reason why Parliament should make the Corporation liable for nuisance in their area and exempt them from liability for nuisance outside their area. The fact that a generating station on the land was authorized by Parliament, and that it was worked without negligence (if that were the case), did not, when there was a nuisance clause in the Act or Order, relieve the undertakers from paying compensation for damage done by the station amounting to a nuisance. He remarked that the Corporation never seemed to have considered when the station was built, to be worked on a larger scale than had ever been done before in England, what would be the effect on the surrounding neighbourhood of so large a quantity of sulphurous fumes being given forth on the site. They had never since consulted any outside experts with regard to whether, by a different construction of works or chimneys, or a restriction of the work of the station, the damage from sulphur deposits could be prevented, or at any rate mitigated. It was a striking fact that no similar damage was known in any other case; and the Corporation were unable to explain why they alone should cause damage. The plaintiff is to have damages and an injunction; but the operation of the latter will be suspended for a year, to enable the Corporation to adopt measures. This is quite satisfactory to the Barton-on-Irwell farmer; the wider application of the case is in the reflection by Lord Justice Scrutton that "the case showed the necessity for Parliament and other authorities concerned giving more careful attention to the provisions for compensation for damage caused by these enormous developments of electrical power stations. Promoters should not be allowed, by abstaining from asking in express words for the exclusion of any duty to make compensation for damage done—a privilege which they would not get if they asked for it expressly—to argue afterwards that their duty to compensate had been indirectly excluded by obscure inferences."

Two-Part Tariffs in London.

Consumers served by the County of London Electric Supply Company, Ltd., are promised advantages, with the advent of 1929, under a two-part tariff scheme and an extensive hire-purchase plan. In the Company's area (which covers over 200 square miles) there are to be two-part tariffs for domestic and business consumers; while hire-purchase terms are to be extended to every type of commercial and household appliance. The charge per unit for current for all purposes will be 1d.; and this will be accompanied by a fixed quarterly charge which in the case of private houses will depend upon the dimensions of the house to be supplied, while for shops and business premises it will be based upon the wattage installed for lighting purposes. Consumers are to have the option of adopting the two-part tariff as an alternative to the present flat rates charged by the Company. For domestic consumers, in the case of houses up to 1000 sq. ft. floor area the quarterly fixed charge will be 12s. 6d.; and no meter rent will be payable. Larger premises are grouped according to the square foot area, and increases are made in the quarterly fixed charge; but the running charge of 1d. per unit is uniform. For an average four-bedroom house, the occupier of which decides to use electricity for cleaning, heating, and cooking, as well as lighting, there will be, it is estimated, a resultant over-all price per unit of about 1¼d. during the year. For shopkeepers and business premises the fixed quarterly charge is assessed on a different basis, owing to the disparity between one shop and another in the use of electricity. The trader will pay his fixed charge on the wattage of the lights he employs on his premises; and then for every unit used for all purposes he will pay the uniform rate of 1d. per unit. It is understood that similar tariff schemes are under consideration for the areas supplied by the South Metropolitan Electric Light and Power Company, Ltd., and the South London Electric Supply Corporation, Ltd.

How the System will Work Out.

The Company are circulating among their 60,000 consumers the following example of the operation of the domestic "all-in" rate: The consumer with a house of a floor area of 1200 sq. ft. will pay 15s. per quarter standing charge (no meter rent); and for 150 units per annum for lighting only will pay 12s. 6d., making a total annual bill of £3 12s. 6d. This shows a saving of 14s. 6d. per annum on the present flat-rate charges. The comparison is made solely on the use of electricity for lighting; but for every unit used there is a charge of 1d. only. In such a house the normal use of a vacuum cleaner, electric iron, electric kettle, electric cooker, and an electric fire, in addition to the lighting, will result in the obtaining of current for all these purposes at a very low average price per unit. The tariff is so designed as to enable consumers to make full use of the supply for all domestic purposes. As an example of the operation of the business "all-in" rate, the consumer with premises having the equivalent of ten 100 watt lamps installed will pay £3 15s. per quarter standing charge (no meter rent), and for 900 units per annum at 1d. per unit will pay £3 15s., making a total annual bill of £18 15s., thus showing an immediate saving of £4 7s. per annum on the present flat-rate charge.

FORTHCOMING ENGAGEMENTS.

Jan. 5.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Newport. Paper by Mr. Kelvin Jones, on "Coal Tar."

Jan. 5.—WESTERN JUNIOR GAS ASSOCIATION.—Meeting. Paper by Mr. W. Rogers, on the "Tankless Holder."

Jan. 5.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of the Tottenham District Light, Heat, and Power Company.

Jan. 9.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to Messrs. Sawer & Purves. Paper by Mr. T. Davis, on "Distribution with relation to the Selling Price of Gas."

Jan. 12.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Joint Meeting with Western District at Glasgow. Paper by Mr. C. Chapman, Provan Chemical Works, Glasgow, on "Tar."

Jan. 16.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

Jan. 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Halifax. Paper by Mr. J. W. Denton, on "High-Pressure Governors and Plant." Inspection of the Halifax Gas-Works.

Jan. 21.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Dinner and dance at the Grand Hotel, Birmingham.

PERSONAL.

MR. JOHN TERRACE, M.INST.C.E.

At the Adelaide Galleries of Messrs. Gatti's Restaurant, Ltd., on the evening of Dec. 14, the members of the Engineering Staff of the South Suburban Gas Company gave a complimentary dinner to their Chief, Mr. John Terrace, M.Inst.C.E. in honour of his election to the Presidency of the Institution of Gas Engineers. Over thirty diners were present.

After dinner, the toast of "The King" was given by Mr. F. G. GORMAN, Assoc.M.Inst.C.E., Deputy-Engineer to the Company (who occupied the chair). The toast of the "South Suburban Gas Company" was proposed by Mr. H. GLASS, Mains Superintendent, and seconded by Mr. GORMAN. Both speakers emphasized the benefits they had derived from the Company, and the advantages of co-partnership.

Mr. A. V. HENDRICKSON, F.I.C., then submitted the toast of "Our Guest." After expressing, on behalf of all those present, the pleasure of having Mr. Terrace with them, he pointed out how much Mr. Terrace had endeared himself to his staff—the main reason being that, as a man, he had recognized the fact that his staff were men also. They were all very proud that their Chief had been elected President of the Institution of Gas Engineers. The toast was seconded by Mr. B. P. BEZANT, of Dartford, who dealt with the work, time, and energy that Mr. Terrace had put in for the good of the Institution and the gas industry as a whole. This toast was afterwards supported by Mr. GORMAN, Mr. W. GOSLING, of St. Mary Cray, Mr. J. RUDLING, of Belvedere, Mr. C. E. CROSS, of Crayford, and Mr. E. F. STEPHENS, of Sydenham, and was accorded musical honours.

Mr. TERRACE, in responding, expressed his great pleasure and pride at the honour his staff had done him; and ended by giving much useful advice to the junior members present as to the advantages of becoming members of the Institution of Gas Engineers.

The toast of the "Engineering Staff" was proposed by Mr. RIX, of Sydenham, seconded by Mr. MACKIE, of Bromley, and responded to by Mr. E. G. DICKINSON, of Sydenham, and that of the "Ladies" was submitted by Mr. GOLDSMITH, of Sydenham, and seconded by Mr. SOPP, also of Sydenham.

The health of the Chairman was proposed by Mr. GOSLING, of St. Mary Cray, seconded by Mr. F. GRAHAM, of Sydenham, and responded to by Mr. GORMAN.

This brought to a close an evening which will long be remembered by the members of the staff.

Mr. S. PEMBERTON, retiring from the Sales Department of the Bradford Corporation Gas Department, after 34 years' service, was the recipient of a presentation from his colleagues of a handsome rosewood chiming timepiece, at a recent social gathering of the sales staff. A previous presentation to Mr. Pemberton, on behalf of the main staff of the Gas Department, was an inscribed gold watch.

Mr. T. H. CANNING (son of Mr. T. F. Canning, Assoc.M.Inst.C.E., Engineer and Manager of the Southend-on-Sea and District Gas Company), who was a successful candidate at the recent Preliminary Examination held at the Institution of Civil Engineers, has been admitted as a student of that Institution.

OBITUARY.

The death has occurred, after an operation in a Manchester Nursing Home, of Mr. FRANK FERNANDO HARRISON, the Secretary and Manager of the Tideswell Gas Light and Coke Company, which position he had held for thirty-five years. Deceased was 68 years of age.

We regret to have to announce the death of Mr. J. OSWELL BURY, who was elected a Director of the Wrexham Gas Company in 1884, and became Chairman in 1894—a position which he held up to the time of his death, which took place in his 82nd year. Mr. Bury, who was a prominent Freemason, spent all his life in public service.

INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A Meeting of the Council of the Institution of Gas Engineers was held at 28, Grosvenor Gardens, Westminster, on Tuesday, Dec. 4—Mr. JOHN TERRACE (President) in the chair. There were also present Messrs. C. S. Shapley and H. E. Copp (Vice-Presidents), H. E. Bloor, J. H. Canning, T. Carmichael, R. E. Gibson, P. G. G. Moon, R. Robertson, W. W. Townsend, J. W. Whimster (Ordinary Members of Council), C. Valon Bennett (Southern Association), D. W. Davies (Wales and Monmouthshire), C. F. Botley and H. D. Madden (Past-Presidents), W. E. Price (Hon. Secretary), and James W. Campbell (Secretary).

The President gave an introductory welcome to the new Secretary, Mr. James W. Campbell, who entered upon the duties of his office on Wednesday, Nov. 21.

In consideration of the extra duties that he had to undertake, due to the illness of Mr. Walter T. Dunn, the late Secretary, and in the period up to the appointment of the new Secretary, Mr. J. H. Winder was granted an honorarium of £50, and his salary was also increased.

It was decided to raise a testimonial fund to show the appreciation of the members of the good work performed by Mr. Dunn during his long period of office as Secretary. Contributions are to be limited to a sum of 5s. per member.

A general discussion was held covering the whole field of the organization of research work by the Institution.

It was reported that Mr. J. Ferguson Bell, Past-President, had been elected Mayor of Derby.

The Council rose in respectful silence at the announcement of the deaths of Mr. F. G. Cockey, of Surbiton (Member), and Mr. J. Fisher Ralph, of Leicester (formerly Associate Member), whose resignation, because of continued ill-health, had been announced at the previous meeting of Council.

Messrs. A. S. Francis, of Clacton-on-Sea, and D. Ritchie, of Aldershot, were approved for inclusion in the next ballot list as applicants for membership, and Mr. W. F. Caton, of Oxford, was elected a student.

The progress made in matters connected with the Institution's application for a Royal Charter was reported by the President.

A scheme for the award of the Institution's Medals in Gold, Silver, and Bronze were discussed; and it was decided that the Gold Medal be awarded for papers read at the annual meetings of the Institution, that the Silver Medal be presented to the member of the Institution who prepared a sufficiently commendable paper read at any meeting of a District Association, and that the Bronze Medal be awarded for a paper of sufficient merit submitted at the meetings of the various Junior Associations.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council took place on Dec. 11 at 28, Grosvenor Gardens, S.W. In the absence of the Chairman (Sir David Milne-Watson), the Chair was taken by Mr. WILLIAM CASH, F.C.A. (Vice-Chairman).

GAS LEGISLATION.

It was reported that the President of the Board of Trade had received a deputation from the National Gas Council on Nov. 27. In order that the President should be under no misapprehension as to what the industry considered would constitute its minimum requirements and which would be likely to be received by Parliament as non-contentious matters, a carefully prepared case had been drawn-up by the Council. This case was read by Sir David Milne-Watson to the President of the Board of Trade at the deputation.

NATIONAL FUEL AND POWER COMMITTEE.

With reference to the invitation which the Council had received to nominate two representatives to serve on the Committee appointed by the Government to consider Gas Supply Network, it was reported that Mr. Thomas Hardie and Mr. Samuel Tagg had been invited, and had agreed to accept the nomination of the National Gas Council.

HOUSING BILL, 1928.

It was reported that this was a Private Member's Bill for the purpose of amending certain provisions contained in Part 2 of the Housing Act, 1925, giving power to local authorities to undertake improvements in connection with housing schemes, and providing for the amount of compensation payable where properties were compulsorily acquired for such purposes. It was not anticipated that this Bill would be dealt with during the present Session, but it was agreed that, if it did come before the House, endeavours should be made to insert certain amendments with a view to providing compensation for gas undertakings where the clearance of sites entailed the diversion or removal of gas mains.

VALUATION OF GAS UNDERTAKINGS IN IRELAND.

It was reported that the rating appeal of a Gas Company in Ireland which had asked for the Council's assistance in March last had been entirely successful. The request was based on the fact that the case raised a question of principle of great importance to all gas undertakings in the Free State, and also to those in Northern Ireland. The point of principle involved was as to what machinery in a gas-works in Ireland might be regarded as forming part of tenants' capital, having regard to the provisions of the Annual Revision of Rateable Property (Ireland) Amendment Act, 1860. In the case of the Gas Company in question, machinery to the value of £5500 was claimed as being provided by the tenant, and the effect of the Judgment

of the Supreme Court that this machinery was properly so regarded was to reduce the rateable value from £965 to £523.

ELECTROLYSIS AND THE FUSION OF GAS PIPES.

It was reported that the small Committee appointed by the Central Executive Board to investigate this matter had met on Nov. 27, and in order to obtain further information they had issued a circular letter to the industry, the replies to which were being tabulated.

FEDERATION OF BRITISH INDUSTRIES.

The following representatives were re-elected to represent the Council on Main Group 9, Sub-Group 1, of the Grand Council (Chemicals, Fertilizers, and Explosives): Mr. C. F. Botley and Mr. T. Hardie.

The following representatives were re-elected to represent the Council on Main Group 14, Sub-Group 3 (Public Utilities): Mr. F. J. Bradfield and Mr. F. W. Goodenough. Upon the resignation of Mr. W. J. Sandeman from the Committee, it was agreed that his place should be taken by Mr. L. E. Clift.

REPORT OF THE GAS AND ELECTRICITY JOINT COMMITTEE.

Approval was given to the suggestion that the Report by the Gas and Electricity Joint Committee should be published, provided that such a course commended itself also to the Institution of Electrical Engineers.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Visit to the Oswald Street Gas-Works, Burnley.

A Special Meeting of this Institution was held at Burnley on Friday, Dec. 14, and was taken part in by over eighty members. It began with a visit to the Oswald Street Gas-Works of the Burnley Corporation. The visitors were received at the Town Hall by the MAYOR (Councillor H. Lees), who extended to them a welcome, expressing the wish that they would find their visit interesting and instructive.

Afterwards they proceeded in motor 'buses to the gas-works. These are newly erected and were formally opened on Oct. 24 by Sir Richard Threlfall, G.B.E., F.R.S. An account of them appeared in our columns at that time [see "JOURNAL" for Oct. 31, p. 337].

Items of special interest, to which the attention of the visitors was directed, were the Sulzer dry-cooling plant, horizontals with Congdon installation, and Travers and Clark water gas plant.

After the inspection of the works, the visitors proceeded to the Church Institute Assembly Rooms, where arrangements had been made by the Burnley Corporation to entertain them at luncheon. Mr. R. GINMAN, of Leek, the President of the Manchester Institution, was in the chair.

VOTE OF THANKS.

Mr. SAMUEL TAGG, of Preston, proposed a vote of thanks to the Corporation, and to the Mayor personally as the Head of the Corporation, for the welcome which had been given to the visitors, the privilege of inspecting the Oswald Street Works, and their hospitality in entertaining the company. He said it was a matter of regret to many who received invitations to attend the official opening of the works in October, that they were prevented from availing themselves of it owing to the "B.C.G.A." Conference being held at York at that time. The opening ceremony was a function of distinction, but perhaps on the present occasion the visitors had been fortunate in that they had a better opportunity of inspecting the works and of gaining a general idea of the lay-out. They were now able to bear testimony to the ability and skill displayed in the design and construction. The name of Burnley was associated with the scientific side of gas production many years ago. He recalled the names of Ross and Leather, and the work they did in the evaluation of gas oils for enrichment and for water gas purposes. In these new works, one observed on every hand evidence of an intention to profit by the progress which had been made in all branches of science connected with the gas industry, in order to find satisfactory solutions of the problems which arose in carrying on the undertaking, and to render the process of gas manufacture what it should be—one of the most scientific of industrial processes. The alliance between the Borough Surveyor and the Gas Engineer appeared to have borne very good fruit. The general design of the buildings was most scientific. In some respects it was unusual, and might be made the subject of interesting comment; but on this occasion he would not attempt criticism. It was sufficient to acknowledge the ability which had been displayed in the design and construction, and to congratulate the Burnley Corporation upon the results which had been achieved.

Mr. W. M. CARR (Stretford) said they required some little time to digest what they had heard and seen before they expressed definite views. Certainly wonderful work had been carried out by the officials of the Corporation. No matter how long the visitors might have been in their profession, they must have found in the plant inspected that morning something which was new to them. Personally he very much admired the lay-out. It was with great pleasure that he seconded the vote of thanks.

The MAYOR, in reply, remarked that he was a member of the Sub-Committee who, after investigation, reported to the Town Council that it would be useless to spend money in trying to improve the old plant, and that the best policy was to build a new works. It was gratifying to find that experts believed something useful had been accomplished. He knew that gas engineers were required to tackle many problems, and he particularly wanted to draw their attention to this one—could a method of gas storage be devised which would render immense gasholders unnecessary? Gas engineers might take a pride professionally in the capacity and size of those things, but they were eyesores to the residents in a town.

BUSINESS MEETING.

Following the luncheon, a meeting was held at the Town Hall—Mr. R. GINMAN presiding..

Mr. J. HERBERT CLEGG, F.C.S., of Burnley, then read a paper entitled "Dry Coke Cooling by the Sulzer Process at the Oswald Street Gas-Works, Burnley." The paper and subsequent discussion follow hereafter.

A CIVIC WELCOME FROM THE MAYOR OF BURNLEY.

DRY COKE COOLING BY THE SULZER PROCESS AT THE OSWALD STREET GAS-WORKS, BURNLEY.

By J. HERBERT CLEGG, F.C.S., of Burnley.

[Paper before the Manchester District Institution of Gas Engineers, Dec. 14.]

The plant which you have seen to-day consists generally of a pair of hot coke skips and bogies, hot coke hoist, coke cooling plant of two sections, each complete with waste-heat boiler, gas circulating fan, and cold coke receiving hopper.

The erection of this plant was commenced towards the end of 1926. As on the whole of the new works a grant was made by the Unemployment Grants Committee consisting of 50 p.ct. of the interest for the period of the loans, or 15 years, whichever may be the less, the conditions attached to such grant, including the recruitment of labour from the Unemployment Exchange, applied. A further condition was that the whole of the workmanship and material should be British, with the exception of certain special features, amounting in value to £1000, which were to be manufactured in Messrs. Sulzer's works at Winterthur, Switzerland. This cost had also to include the erection by Swiss skilled labour on the site.

GUARANTEES.

The plant was completed and put to work in February, 1928. Stringent guarantees were required in respect of the capacity of the plant for coke cooling and steam generation; the guarantee test providing that the plant should run for a period of 72 hours conducted by the Engineers of Sulzer Bros., with instruments provided by the Burnley Gas Department. The technical guarantee given by the above firm was as follows: That the plant will produce an average of 840 lbs. of steam from and at 212° Fahr. per ton of coke cooled from a temperature of not less than 1000° C., and on condition that the retorts are drawn in groups of sufficient number, and at such intervals as will give the cooling reservoirs a regular supply along the lines laid down. The guarantee was subject to the coke cooled having an ash content not exceeding 10 p.ct., and a maximum of 5 p.ct. of dust and breeze under ⅝ in.; provision being made for variation in these quantities. The quantity of coke to be delivered should not be less than 85 p.ct. of the normal capacity of each unit, and the feed water should be supplied at a temperature of not less than 100° Fahr.

The capacity of the plant is such that each coke cooling container is capable, in normal working, of dealing with 30 tons of coke supplied within 7 hours, with subsequent interval; or 120 tons of coke per day in continuous operation through the twenty-four hours; or 48 tons of coke supplied within 8 hours with subsequent interval. The latter performance was to be required in case of emergency, should one container be out of commission and the guarantee would not apply during this rate of cooling. The temperature of the coke after cooling, as specified, was to be below the ignition-point in normal working, and to leave the plant at about 250° C. The steam guarantee is based on a coke temperature of 1000° C. in the turning chute immediately before the discharge into the container.

The object in constructing the plant in duplicate form was, of course, to have a stand-by in case the plant required to be shut down for cleaning, repairs, or for attention to the boiler and steaming apparatus. Further, in the event of the container being out of action, it would have been necessary to instal alternative wet-quenching apparatus to deal with the coke in the interim. Wet-quenching of course we wish to avoid. The size of the individual containers was based on the possibility of an extension of our present works, which, when completed, will consist of three complete units, the second of which it was expected would be installed in 1929. The high production of steam per ton of coke, mentioned previously, would not be forthcoming when both carbonizing plants were on full load; but as this position would not arrive for some years, and even then would only apply for a short period during the heavy season, each plant would be capable of producing, for the major portion of the year, the guaranteed output required. In any case, upon reaching the maximum output from No. 2 carbonizing plant, the production of steam would be in excess of our normal requirements.

DESCRIPTION OF THE PLANT.

Hot coke is discharged direct from the retorts through a Gibson-Nicol coke discharger, and through openings in the side of the retort house into the coke skip. An opening is arranged opposite the discharge side of each bed of retorts, fitted with balanced sliding doors; and inclined chutes suitably strengthened are fitted to carry the coke to the skip without distortion arising from the heat. The skip bogie traverses a single line of railway track, running parallel to the retort house and having a centrally placed by-pass loop on the farther side. The railway track is provided for the haulage of the hot coke skips to and from the hot coke hoist by a steam accumulator locomotive.

Hot Coke Skips.—The two hot coke skips which have been provided each consist of hinged bottom braced skips resting and carried on a bogie truck arranged for travelling on standard gauge track. Each truck is built up of a braced frame of steel joists and channels, and is fitted with buffer beams, spring buffers, and automatic couplings at each end. The frame is carried by axles set at wheelbase centres of 9 ft. and suitably sprung (fig. 1).

The skips have a length of 9 ft. 5 in. and a top width of 8 ft. 8 in., and are built with tapered sides so that the bottom discharge opening is 9 ft. 5 in. long by 4 ft. 8 in. wide. The skip is built-up on a framework of steel angles and channels, the sides and ends being formed by 8 in. by ½ in. steel flats, attached to the framework, with ½ in. spaces between the flats. Each skip is provided with supporting rods to which the lifting bale of the hoist may be attached.

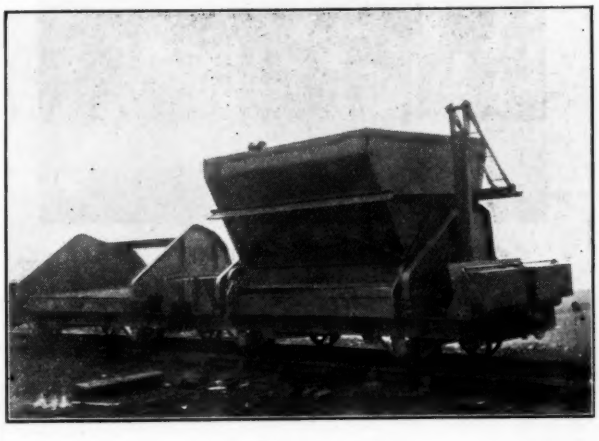


Fig. 1.—Hot Coke Skip.

The steam accumulator locomotive is of the four-wheeled coupled type, made by Messrs. Andrew Barclay, Sons, & Co., Ltd., of Kilmarnock, and has a reservoir capacity of 150 c.ft. The cylinders are 12 in. diameter by 18 in. stroke, and the wheelbase is 5 ft The reservoir is charged with steam from a standpipe supplied direct from the works boilers, until the pressure in the reservoir registers 160 lbs. per sq. in. The locomotive is then ready for work, and will continue at work until the pressure in the reservoir falls to about 40 lbs. per sq. in. The amount of steam required per charge is 450 to 500 lbs., and one charge is sufficient for 6 to 8 hours' work in moving the coke skips from chute to chute, and to and from the hot coke hoist.

The coke cooling plant is carried on a reinforced concrete superstructure at a height of some 22 ft. above the ground level (shown in fig. 2), and the floor is arranged in the superstructure at a height of about 8 ft. above ground level, to provide a house for the inert gas fans. Below the ground floor level a discharge pit has been arranged, together with a ferro-concrete receiving hopper with discharge doors for the cooled coke. As the charging door for the coke containers is at a height of 45 ft. above ground level, the hoist is necessary to raise the skips of hot coke to such a height as will enable their discharge by chutes into the containers.

Hot Coke Hoist.—The hot coke hoist (photograph A.87) consists of a braced rectangular hoist frame about 75 ft. in height, fitted with a pair of electrically driven spur-geared winches mounted in a cabin at the top. The hoist tower is 14 ft. by 12 ft. 4½ in. in plan, with entrances at each side so that when necessary the locomotive and skips can pass through the hoist. The skips of hot coke are shunted directly into the base of the hoist, and the lifting bale is attached to them. The skip, with its hinged bottom, is then conveyed to the top of the hoist for tipping purposes; and when the skip has been raised to a sufficient height, 2 pins on its bottom door engage with stops, causing the hinged bottom to tilt to the necessary angle and fall away from the upper portion of the skip. This gives an aperture of sufficient area to enable the coke to be discharged from the skip into chutes leading to the mouth of the containers. Each hoist winch is driven by a 50-H.P. motor, and balance weights are provided for balancing the weight of the skip of coke. After discharge, the skip is returned to the bogie at the base of the hoist, and removed.

Fig. 2.—Coke Cooling Plant.

Suitably placed chutes are attached to the hoist to direct the flow of hot coke to the mouth of the container (shown in fig. 3). The lower length is designed as a turning chute, so that it may be directed to the mouth of either container as desired. A 3-H.P. electric motor is arranged to turn this chute, and the whole is automatically controlled. The hoist is designed for a load of 3½ tons of coke, and has a hoisting speed of about 70 ft. per minute.

On the control stand for working the hoist, which is fitted on the ground under the first floor of the plant, is a selector switch which regulates the position of the turning chute; the switch being set by the attendant to deliver the coke into either container as required. There are two complete sets of control gear, one for each winch respectively; and one winch is kept as a stand-by in case of breakdown or repairs. The speed of travel of the hoist is governed by a controller of the tramway type, but the hoist is stopped both at the top and the bottom of the tower by suitably placed limit switches.

It must be explained that the coke cooling plant proper consists of two steel-cased coke containers, each complete with subsidiary apparatus. The fan house, previously mentioned, contains two electrically driven circulating fans, each of which is driven by a 30-B.H.P. electric motor. The upper ferro-concrete floor is arranged on the top of the concrete columns, and is designed to carry the waste-heat boilers. The conical base of the cooling chambers is built in ferro-concrete, and carried by this floor. The discharge chutes from the base of the containers are constructed in ferro-concrete, and are shown in fig. 4.

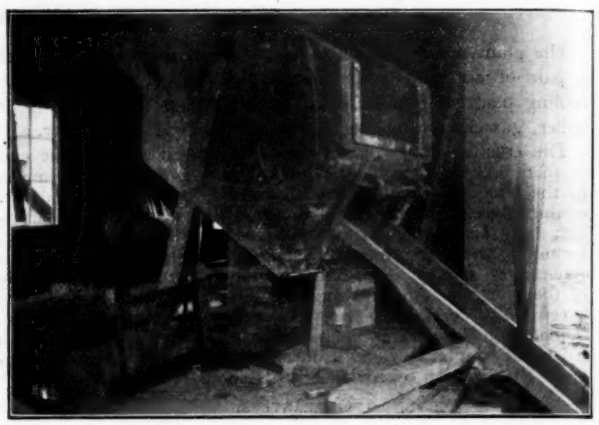


Fig. 4.—Discharge Chutes from the Containers.

In the coke delivery pit previously mentioned is arranged the base of one cold coke hoist, allowing room for a second to be installed at a future date. Supported on the walls of the hoist pit a cold coke receiving hopper with two discharging mouthpieces has been arranged, the hopper being constructed in concrete. This hopper is also provided with a back entrance, so that coke already in the yard stock may be delivered into the same and passed forward to the screening plant hoist, if so desired. The ferro-concrete chutes for discharging cooled coke are continued in an inclined direction until they enter the cooled coke receiving hopper, and from each of these chutes a branch chute has been arranged so that cooled coke may be discharged direct to the yard, if desired in the event of repairs being necessary to the screening plant hoist.

The interior of the receiving hopper is also arranged so that coke may be fed from either plant to either of the discharge doors for use when the second coke hoist is installed. Suitably hinged doors are provided on the extension of the discharge chute to allow any excessive gas pressure to be vented during the discharge of coke. The two containers are each made up of an outer steel casing ½ in. in thickness, the base of which is attached to the ferro-concrete cone by a gas-tight joint. Each container is circular in plan, and is built with conical upper and lower portions, the largest diameter being 11 ft. 6 in.; and the capacity of each vessel is equivalent to about 30 tons of coke. A double lining of "Celite" insulating medium is arranged inside the steel containers, and an inner lining to this of firebrick 14 in. in thickness. The ferro-concrete base of the coolers is also lined with 4½ in. of blue brick.

In order that the discharge of cooled coke from each container may be regulated both in speed and in amount, a curved iron fork regulator is built into each discharge chute and fitted with suitable operating gear (as shown in fig. 5). An air-tight

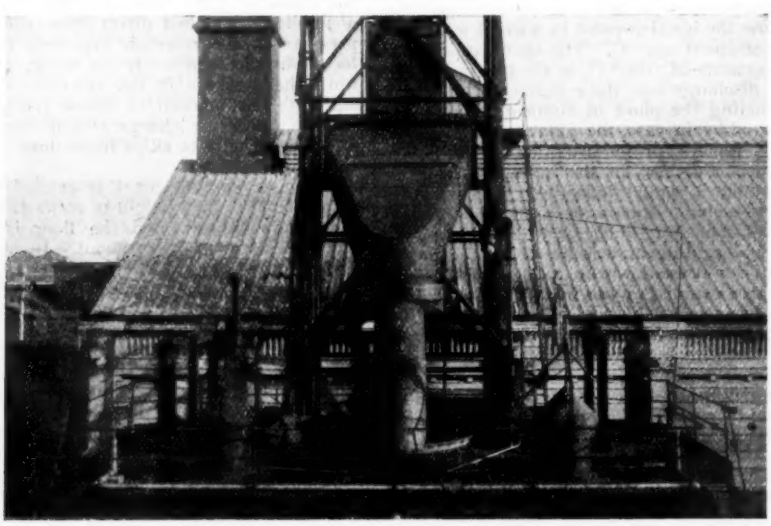


FIG. 3.—MOUTH OF THE CONTAINER.

discharge door with locking gear and frame is fitted to the end of the discharge chute below the fork regulator, and is operated externally by levers.

At the upper end of the containers a steel-plate operating floor is carried from the sides of the containers. It must be stated that the charging aperture to each container consists of a circular iron hinged cover, with edges of rustless steel dipping into a circular trough provided with a water seal, and an inlet mouthpiece to protect the brickwork round the doorway. Near to the upper end of the containers, suitably cased ducts are constructed of steel plate lined with firebrick for conveying the hot gases from the containers to the waste-heat boilers. Connecting with this flue is a safety flap door device to allow for the release of any excess pressure of the gases in the flues. The steam superheater is also fixed in this flue, which is so arranged that the gases may be by-passed as required.

Waste-Heat Boilers.—Each waste-heat boiler is capable of evaporating 5000 lbs. of water from and at 212° Fahr., and is of the fire-tube type, 9 ft. in diameter by 15 ft. 6 in. long, containing 326 tubes of 2¾ in. outside diameter. Provision is made for a superheat of 185° Fahr., provided the temperature of the gases leaving the containers is sufficiently high. The inert gases pass through the upper smoke tubes to the end of the boilers into a collecting box, and then return through the lower series of tubes to the exit chamber. This exit chamber is connected to the inlet side of the fan by a steel duct; and a further duct is arranged between the fan exit and the base of the container. The duct between the boiler exit and the fan is provided with a dust-catcher, and the duct from the pressure side of the fan terminates in the interior of the cooling chamber by a gas distributor placed centrally therein to permit of a free passage of gas through the whole area of the coke to be cooled. Suitable tube-cleaning steam apparatus is provided for each boiler.

Fig. 8.—Showing Iron Fork Regulator.

Circulating Gas Fans.—The circulating gas fans are specially built to withstand hot gases at a temperature of 200° to 300° C., and are provided with oil-cooled bearings and flexible couplings. The speed can be varied between 750 to 1400 R.P.M. by shunt regulation.

Operation of the Plant.

The coke skip conveys a load of some 3 tons of hot coke to the plant at each journey, from 5 to 6 retorts; the skip being moved along the front of the bench as each retort is discharged. A sufficient time is given to allow any excessive volatile matter, resulting from unburnt ends of charges, to disperse; this usually occupying from 2 to 3 minutes, when the skip is hoisted to the top of the hot coke hoist. Simultaneously the lid of the container is lifted, and the first turning chute is brought into position over the charging aperture. After discharging, the turning chute is moved to the mid position, the lid of the container closes, and the skip is returned to the base of the hoist (fig. 3).

Immediately previous to the operation of charging the container, a quantity of cooled coke is withdrawn to make room for the incoming charge; the rule being to keep the containers full of coke under normal working conditions. The speed of the fan is adjusted to suit the quantity of coke to be cooled per shift, or the production of steam required, and the quantity of coke in each container can be ascertained by the measuring device. The fan works at a pressure of about 2½ in. W.G. at the base of the cooling chamber. After passing the coke, the pressure is diminished to less than 0·5 in. at the top of the cooling chamber. A suction of about 2 in. W.G. is necessary at the inlet of the fan to draw the gases through the superheater and boiler tubes. During the periods of charging the cooler, the pressure diminishes by 0·2 in. to 0·3 in. of water, and 0·8 in. to 1·0 in. of water when coke is being discharged.

The temperature of the gases leaving the coke depends on the temperature, the amount, and the frequency of the supply of coke. As the period of maintenance by the Contractor has not yet expired, the official guarantee tests have not been undertaken, but spot tests have led us to believe that the guarantee is a conservative one. Only one man per shift is required to operate the plant, and one man to drive the locomotive and manipulate the skips—*i.e.*, two men per shift from the outside of the retort house to the cold coke elevator head.

The chart (fig. 6) gives the result of observations taken over a period of 5 hours when one machine was working at full capacity.

Below are given temperatures and analyses of the gases normally found at different periods of the operation of the plant.

Average Temperatures (°C.) of Gases Taken Before and After Charging, Working 3 Shifts and 12 Settings.

—	Inlet Superheater.	Inlet Boiler.	Return Boiler.	Outlet Boiler.	Inlet Fan.
Before charging	391	388	227	199	191
After charging	612	527	232	201	196

Analyses of Circulated Gases.

—	N_2.	O_2.	CO_2.	CO.	H_2.	CH_4, &c.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Immediately before charging	78·7	0·2	11·3	4·8	5·0	..
After charging	75·8	..	11·2	8·0	5·0	..
30 mins. after charging	78·6	0·4	9·4	5·8	4·8	1·0

Below I give particulars of an evaporation test of 24 hours' duration.

Evaporation Test, Oct. 24, 1928.

Duration of test	24	hrs.
Temperature of coke entering containers, av.	1,895°	Fahr.
,, ,, ,, leaving ,, av.	390°	,,
Difference	1,505°	,,
Coke charged	103	tons
Available heat in coke (103 × 2240 × 0·355 × 1505)	123,250,000	B.Th.U.
Temperature of superheated steam, av.	551°	Fahr.
Steam pressure, av.	194	lbs. sq. in.
Superheat	165°	Fahr.
Temperature of feed water, av.	129°	,,
Total heat in steam per lb. (including superheat)	1,181	B.Th.U.
Actual evaporation per 24 hrs.	79,000	lbs.
,, ,, ,, hour, av.	3,291	,,
Water evaporated, from and at 212° Fahr.	96,577	,,
Water evaporated, from and at 212° Fahr., av. per hour	4,025	,,
Water evaporated, from and at 212° Fahr., per ton coke charged	937·6	,,
Total heat put into steam (79,000 × 1181)	93,299,000	B.Th.U.
EFFICIENCY OF COOLING PLANT.	75·7	p.ct.

None of these tests was taken for the purpose of this paper; all are ordinary working tests taken in the control of the plant.

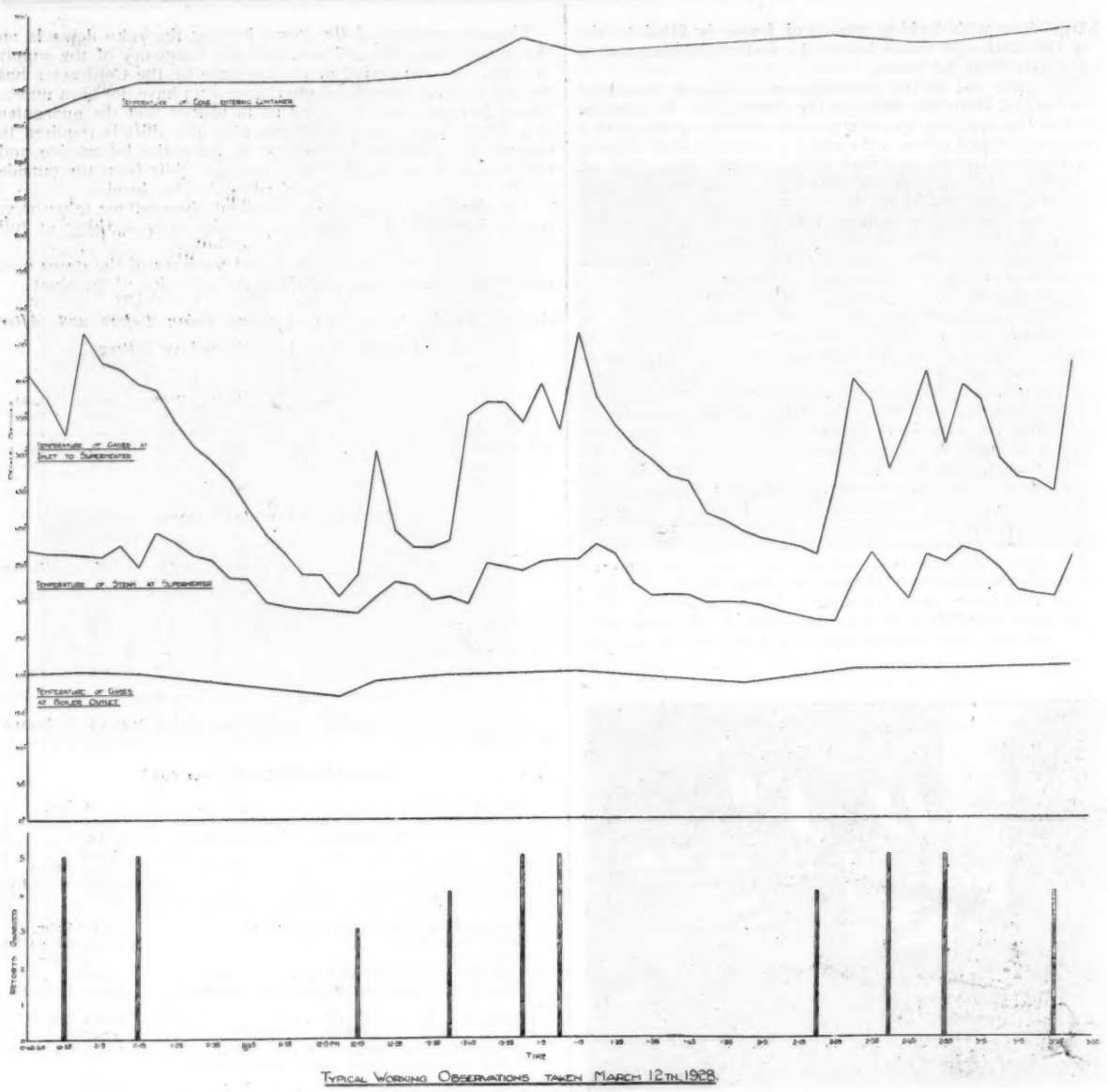
The Dry Coke.

The coke produced, samples of which are available for your inspection, is of good grey appearance, uniform in size, and in pieces of about 3 in. to 3½ in. Below I give analyses of this coke compared with the same coke quenched by the use of a generous amount of water, and carefully quenched by hand. As a comparison I include analyses of vertical coke produced on our own works last year, low-temperature coke, and furnace coke prepared to compete with gas-coke.

Analysis of Various Cokes, on Wet Sample.

Description.	Moisture.	Volatile Matter.	Ash.	Fixed Carbon.	B.Th.U. per Lb.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.	
Excessively quenched horizontal coke, Oswald St., 29/11/28	23·06	0·77	8·3	67·87	10,130
Carefully quenched horizontal coke	8·26	0·91	7·91	82·92	12,370
Dry coke, Oswald St., 30/11/28	0·10	0·80	7·5	91·60	13,640
Vertical coke produced last year (no steaming), Parker Lane	1·2	0·80	8·9	89·1	13,270
Low-temperature coke, sold as smokeless fuel	3·9	5·9	5·8	84·4	13,360
Well-known graded furnace coke produced from washed smalls	5·9	2·8	10·5	80·8	12,370

I think it will be agreed that from the consumers' point of


Temperature of Coke entering Container
Temperature of Gases at Inlet to Superheater
Temperature of Steam at Superheater
Temperature of Gases at Boiler Outlet
Retorts Charged
Time

TYPICAL WORKING OBSERVATIONS TAKEN MARCH 12TH, 1928.

Period of test	4 hours 50 mins.
Beds working	14
Water evaporated	3250 lbs. per hour (average)
Average temperature of feed water	136° Fahr.
Retorts of coke charged into cooling plant during test	45

FIG. 6.

view it is desirable that coke should be sold in a dry state The calorific value is, of course, substantially increased, and the heat which would otherwise be lost in the evaporation of the water in wet-quenched coke is also available by the consumer. The coke has proved very popular, and although this year we have an excess production of about 20,000 tons above the town's requirements, I find that we have no difficulty in selling it.

Contrary to expectation, from tests made and observations of this coke, when used in some domestic grates or blacksmiths' hearths, and even in some slow-combustion stoves, it is not as easy to ignite as wet-quenched coke. Although there is no necessity from a commercial point of view for any further treatment of the coke, I intend shortly to make experiments in order to render our coke as easily ignitable as the product of low-temperature carbonization. The test figures submitted of wet-quenched horizontal, vertical, and furnace coke are, it will be admitted, of a higher standard than would be obtained from many cokes produced at the present day.

DENSITY AND STRENGTH OF THE COKE.

I can confirm the remarks of Mr. Beebee, of the Rochester Gas and Electric Corporation, in a paper given in 1927, that the dry-quenched coke resists handling better than the wet-quenched, and that as a result of the coke being passed through the cooling plant it is reduced to a remarkably uniform smaller size than is usually obtained from other wet-quenched vertical or horizontal coke. This I find is of great advantage to the consumer both at home and abroad.

Below are given figures showing the percentage of the gradings obtained from the coke after screening, and without any mechanical crusher. The figures are based on actual weighings of coke used and sold over a period of seven months, to Nov. 30 last. The measurement per ton is also given.

—	P.Ct.	C.Ft. per Ton.	Hectolitres per Ton.
Screened coke	63·0	89·7	25·4
Large nuts	13·6	83·0	23·4
Medium and small nuts	17·0	82·0	23·2
Breeze under ⅜ in.	6·4	60·0	16·9

It will be observed that this closely approaches the measurement given by vertical retort coke; and consequently we have no difficulty in disposing of our coke for continental sales.

STOCKING.

After being elevated from the coke cooling plant, all our coke is passed over a small cascade screen, and the screenings pass through other revolving screens to obtain the various grades required for sale. The screened coke is then passed by belt conveyor to the six store hoppers, each of 60 tons capacity. The whole of the bunkers and plant are covered by a roof of asbestos sheeting. Although we can hold three days' stock, it is necessary at times to store a quantity in the yard. A heap of this coke, after standing in the yard for a period of nine months, was found to have deteriorated so little as not to require fork-

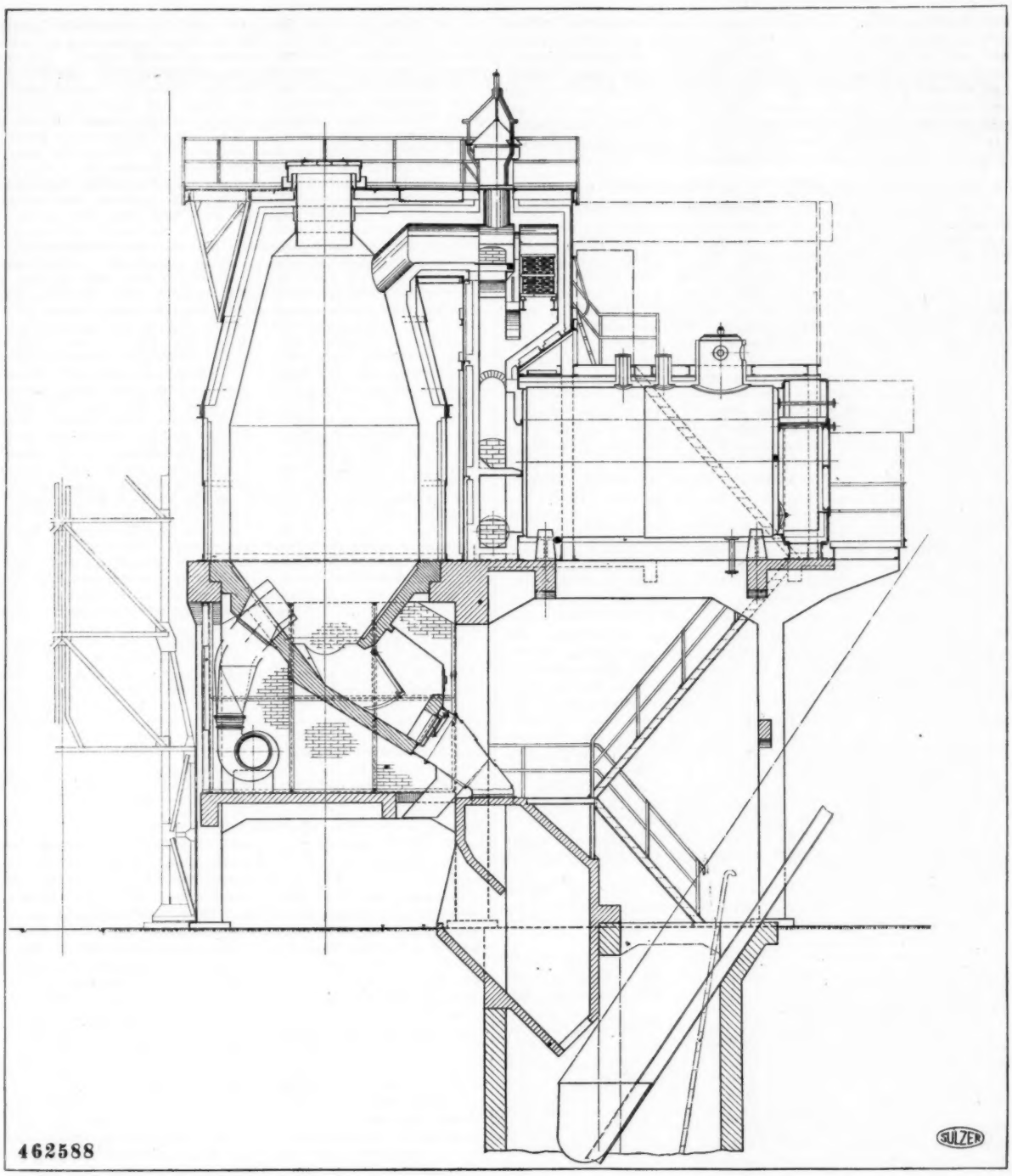


FIG. 7.—GENERAL ARRANGEMENT OF THE SULZER PLANT AT BURNLEY.

ing; and a moisture test indicated that not more than 1·5 p.ct. of moisture had been absorbed from the frequent rains which had poured upon it.

OTHER FACTORS IN WORKING.

During the operation of the plant a quantity of fine dry coke dust is accumulated from the dust-catchers, amounting to 2 or 3 cwt. per day. The fluid nature of this dust suggests that it might be suitable for use in pulverized fuel installations if produced on a larger scale. Owing to the dry nature of the coke it is inevitable that dust should arise when discharging, but as far as possible all discharging arrangements have been enclosed to minimize any nuisance. A scheme for the removal of this fine coke dust from the subsidiary chamber has been considered, but I hardly think that the nuisance is so great as to warrant the expenditure which would be involved.

Undoubtedly in the utilization of the coke cooling plant with horizontal retorts, difficulties arise which do not occur in its employment in the cooling of coke from chamber ovens, which discharge coke in quantities of 6 to 7 tons in bulk. In such case there are no black ends, and the coke skip is not subjected to such a prolonged contact with the hot coke.

In operating the plant as previously mentioned, it is desirable that uncarbonized coal should not enter the container; otherwise an explosive mixture will result which is liable to ignite. A more serious danger is one which we have recently experienced, due to leakage of steam from the superheater tube which had been worn by the attrition of the coke dust carried forward by the circulating gases. This caused the production of water gas in the container; and in order to effect the necessary repairs, the plant was quickly closed down. Before putting into operation, a similar fault developed on the second plant, which was worse than in the first. The defective tubes have been removed, and protection plates $\frac{3}{4}$ in. thick placed over the superheaters where the incoming gas originally came through the ports to impinge on the superheater tubes. I anticipate no further trouble in this direction.

After our experience of waste-heat boilers fixed in horizontal retort settings, we rather anticipated that we should have a deposit in the boiler tubes, but we have not yet had occasion to use our cleaning apparatus. The tubes are as clean as when they were installed.

The plant is adequately provided with explosion doors, so that if an explosion occurs, no damage to the plant may result.

In order to obtain a continuous indication of the contents of the circulated gases, and to afford prompt warning of any leak-

age resulting in the production of an excessive amount of hydrogen or carbon monoxide, a "Mono" recorder has been ordered and will shortly be fixed. This apparatus, which will serve either unit alternatively, collects continuous samples of dried and filtered gas. A hot-wire electric furnace, and absorption and measuring vessels, enable the following to be read at will by the adjustment of control cocks—(1) CO_2 percentage; (2) $CO_2 + CO + H_2$ percentage; (3) H_2 percentage; (4) zero. Thus, by difference, the carbon monoxide may be arrived at.

Costs and Economy of Dry Cooling.

It is difficult to give this information without some degree of estimation; and the resulting benefits must of course fluctuate with the price of coke and the circumstances applying to the individual undertaking concerned. The market value of coke has decreased substantially since our order was placed for this plant, but I venture to assert that we would not have found it possible to dispose of our largely increased quantity of surplus coke had it been wet-quenched. We have no stocks, and we could sell more dry coke than we have available, either for shipment abroad (which course we have mainly adopted) or for land sales outside our area of supply. Judging from the ridiculous prices at which some of my defaulting brother gas engineers are offering coke for delivery into Burnley—unsuccessfully—the disposal of wet-quenched coke is a serious problem at the moment. Heavy stocks are well-known to be very unremunerative on account of the deterioration and cost of handling. At a modest estimate, based on actual receipts, the value of dry-cooled coke is 2s. 6d. per ton more than wet-quenched, which sum more than disposes of the loss in weight obtained by selling water as fuel.

In considering the cost of our installation, it must be borne in mind that the hoist, cooling plant, and coke hoist pit are constructed to deal with double our output. The whole cost, including all plant, rails, locomotive, &c., from the retort house to the cold coke elevator, is £21,600. An approximate value of £9000 is expended on account of future extension. An alternative scheme of coke handling and quenching, steam raising, &c., would depend on the type of works, plant adopted, and the quality of the same. In our case, with the addition of a boiler house, coke feed to the same, and extension of the chimney, such an alternative plant would cost approximately £10,000. The annual charges, based on the period of loans allowed for repayment, are £1983 on the £21,600; the charges on the same basis on the alternative plant would have been £1020 p.a.—a difference of £963 per annum chargeable to the Sulzer installation as it stands at present. Three men less per day are employed than would be required to produce steam by solid-fuel boilers, on a low estimate, as our works are maintained for the major portion of the year by steam produced from waste-heat boilers.

Our present annual generation of steam from the Sulzer plant is about 18,000,000 lbs. p.a., from which you can deduce your own costs of production, and the saving experienced in this direction.

The amount of current used for the whole of the Sulzer plant is 2·7 units per ton of coke cooled. Our current, based on very careful calculation over the year, does not exceed ½d. per unit at the switchboard.

The saving in quenching water amounts in our case to £300 p.a., as we have to purchase entirely the whole of our water supplies from the Corporation at a fairly high figure. By using dry coke in our water gas plant, a saving results of £300 p.a. in fuel consumed. A substantial benefit is derived from the reduction in breeze produced by dry cooling as against wet quenching. The exact amount of breeze produced by the mechanical handling, apart from its passage through the Sulzer plant, cannot be readily ascertained, but I am convinced that we have reduced our breeze production by at least 5 p.ct., which in itself at the present time is equivalent to £750 p.a. Another advantage which, while not assessable, is of great financial importance, is the absence of corrosion due to the large volumes of acid-laden steam emitted during wet quenching.

From my experience on other installations, I am satisfied that the maintenance charges on the dry coke plant will not be any higher than on alternative plant as used on a horizontal installation. To those engineers who prefer horizontal to vertical carbonization on other grounds, a dry-cooling plant gives them certain advantages applicable to the latter.

Conclusion.

Owing to the very short time at my disposal, this paper has had to be hurriedly prepared, and I crave your indulgence if it does not fulfil your expectations. I only hope that the information which I have submitted will have interested you in some degree.

I wish to express my thanks to those members of my staff, and of the Borough Analyst's Department, who have assisted me in obtaining the data required for the preparation of this paper.

Discussion.

The President said he was sure they had all gained more knowledge of the dry cooling of coke by the Sulzer process. He was not in a position to criticize the paper, but it occurred to him that it would be of general interest if Mr. Clegg could tell them the limit of size of works in which this plant could be economically installed. Take his own plant at Leek, with an output approaching 200 million c.ft. per annum. They had continuous vertical retorts. The coke, of course, was cooled in the process, and they screened and graded it.

Mr. William Buckley (Droylsden) remarked that he had found the plant extremely interesting. Mr. Clegg had raised an interesting point by his statement that, contrary to expectation, the coke dry cooled in the Sulzer plant was not as easy to ignite as wet quenched coke, when used in some domestic grates or blacksmiths' hearths, and even in some slow combustion stoves. Perhaps Mr. Clegg could give them some reason why that was so. At first one might think that, as carbon dioxide and nitrogen were circulated, the interstices or the cells of the coke might get filled with those inert gases, and so combustion would be retarded; but if the law of diffusion came into operation, a short period of exposure to the atmosphere should eliminate that source of trouble. From what he saw of the product, he gathered that it was a typical horizontal coke, perfectly dry. Apparently there was no reason why it should be more difficult to ignite than the coke which was obtained from the vertical retort.

Mr. W. M. Carr (Stretford) asked whether, having regard to the normal yield of coke from the particular class of coal which was being carbonized, the yield which Mr. Clegg got from the horizontal settings was, after treatment in the Sulzer plant, practically the same as the yield he would get if he quenched the coke, and a correction was made for moisture. Judging from the last report of the Gas Research Fellow, he thought that the results of the experiments mentioned in the report indicated that the ignition temperature of coke varied very considerably in relation to the temperature of carbonization. As the latter increased, so the ignition temperature increased. Speaking from memory, he believed there was a comparatively low ignition temperature up to 900° for the carbonization temperature. It might be that the condition of difficulty of ignition referred to was not caused by the Sulzer plant, but was brought about by the temperature at which the retorts were worked. The figures of the savings attributed to the Sulzer plant were interesting, especially the £300 per annum estimated to be the saving in the quenching water, as the result of using dry coke. It seemed an extraordinarily high figure; and he would be glad if Mr. Clegg would give some information as to how it was arrived at.

Mr. W. J. Smith (Bolton) asked whether, with varying working conditions, it was possible for the outlet temperature to be so low that there would be condensation of moisture on the tube of the boiler, and a deposit of sulphuric acid. The figures given for ash content, moisture content, &c., appeared to show that Mr. Clegg was moving towards the ideal position with regard to coke. All gas undertakings ought to look to their coke from the point of view of the ash content and the moisture content, and also from the standpoint of grading. The sales of coke for domestic purposes should be pressed forward. He felt that what had been done in that respect by Manchester, Birmingham, and Stockport could be done in other places.

A Vote of Thanks.

Mr. R. E. Gibson (Liverpool), in proposing a vote of thanks to Mr. Clegg, said he wished the members had had the paper earlier, so that they might have studied it at greater length than was possible in the circumstances. He would have liked further light to be thrown upon the financial aspect—upon the saving that might be effected by producing dry coke. In Liverpool they had been producing, for a considerable time, dry coke which was similar in appearance, and probably in nature, to the Burnley product by the Sulzer process. It was very easily ignited, but that had nothing to do with the dry-cooling system; rather it was due to the method of production of the fuel. They had experimented for a considerable time, and thought they were now able to manufacture by the high-temperature process a fuel which would ignite easily, burn freely, and give a good hot fire, and be generally useful for domestic purposes. Plant for producing this fuel had been erected on a small working scale, and they were about to commence operations. One advantage of the process which Mr. Clegg had described was the low percentage of breeze, due to the method of handling gently. He concurred with Mr. Smith in the opinion that gas undertakings should give more attention to the quality of the coke produced. In the Sulzer process, the hot coke was held for a considerable time in the large skips. It seemed to him there must be great wear and tear on those skips. Had Mr. Clegg found out what was their life?

Mr. G. P. Mitchell (Blackburn), in seconding the vote, said that many gas engineers in the service of municipal undertakings were afraid to recommend their committees to adopt anything new. Mr. Clegg had had the courage to carry out an experiment, and the members owed him a debt of gratitude for having done so. It was gratifying to hear that it had been successful.

Mr. Clegg said that his reply to the points raised would be given on a future occasion. He thanked the members for their kindly sentiments, and for the great interest they had shown in the works.

"Definitions and Formulæ for Students."—Sir Isaac Pitman & Sons, Ltd., have published, at 6d. net each, two booklets bearing the foregoing title—one dealing with practical mathematics, and the other with applied mechanics.

Midland Association of Gas Engineers and Managers.—The Association are holding a dinner and dance at the Grand Hotel, Birmingham, on Monday, Jan. 21. Full particulars, and tickets, may be obtained from the Hon. Secretary, Mr. T. Thornton, Rowley Regis, near Birmingham.

THE IMPORTANCE TO INDUSTRY OF EDUCATION FOR COMMERCE.

By F. W. GOODENOUGH, C.B.E., Executive Chairman of the British Commercial Gas Association, and Chairman of the Government Committee on Education for Salesmanship.

[From an Address before the Midland Branch of the Sales Managers' Association at a meeting in Birmingham, on Dec. 10, under the chairmanship of Mr. W. HENDERSON PRINGLE, M.A., LL.B.]

I am very pleased to be in Birmingham—a city teeming with industry, and world-noted for its manufacturing efficiency—and able to take part in welcoming the enterprise of the Birmingham Commercial College (under the able direction of my friend Mr. Henderson Pringle) in establishing courses for Diplomas in Salesmanship for the Home and Overseas Trades; also to have the opportunity of commending that enterprise to the immediate consideration and full support of the employers in the many industries of this great city.

I do so with great pleasure, as Chairman of the Committee recently set up by Lord Eustace Percy "to consider the problem of education for salesmanship, and to make any recommendations for action that, following such consideration, may appear desirable for the promotion, by means of education, of greater efficiency in the marketing of British goods and services, at home and overseas," because every day that I occupy that Chair evidence reaches me to strengthen the view I expressed on the day the Committee held their first meeting—namely, that the great need of our country at this juncture in its history is increased efficiency in the marketing of its goods, which has not kept pace with the increase in recent years in our efficiency in production, for the reason that British manufacturers have continued far too long—and, in respect of far too large a majority, still continue—to believe that fine goods need no selling; that, if you manufacture a first-class article, it will practically sell itself.

COMMERCE THE MOTHER OF INDUSTRY.

Commerce is the veritable Mother of Industry. The maker must be able to market, or all his ingenuity and efficiency come to naught, and the labourer stands idle without the factory walls. If we are to cure unemployment, we must win fresh markets or increase our business in the old. The manufacturer wants orders, and the worker wants wages—not unemployment insurance or charity. And the manufacturer can have his orders, and the worker his wages, if we will go out into the world, properly equipped as salesmen, adequately supported abroad by advertising and propaganda, and constantly supported at home by efficient service and sound policy, and sell our goods as they can and should be sold. But we must make a proper study of this art and science of selling if we are to hold our own with our competitors in the world markets who have trained themselves for the fray. The matter is especially an urgent one for us. As a nation dependent for our very existence on selling manufactured goods to foreign countries in exchange for essential raw materials and equally essential food, we have the most direct, urgent, and literally vital interest in the problem of efficient commerce, of which the beginning and ending is buying and selling—and the greater of these is selling. If we fail to be an efficient nation of shopkeepers, we shall cease to be a nation of manufacturers. Salesmanship to us is a matter of life and death; and we have hardly yet begun to think about it.

I want the manufacturers of Birmingham, and of the country as a whole, to realize that, in pressing upon them the importance—the urgent and vital importance—of this question of efficient salesmanship, I am expressing not academic or armchair views, but views backed by the evidence of world-travelled men of wide experience and trained observation. I may remark that the members of the Committee on Education for Salesmanship are anything but academic or armchair people, as you will see at once from looking down the list, which includes such very live men of business as the President of the Sales Managers in Birmingham, Sir Gilbert Vyle; the Chairman of two great Midland firms; Daimlers and the "B.S.A.," Sir Edward Manville; and Miss Nettlefold, another name to conjure with in this city.

After quoting very striking evidence from Canada, Africa (supplied by Sir Edward Davson), and South America (in the form of a letter from the British Ambassador at Buenos Aires, Sir Malcolm Robertson), Mr. Goodenough proceeded:

KNOWLEDGE OF LANGUAGES.

Let me next quote a reference to a subject to which I am very glad to see the Birmingham College of Commerce is giving prominence in its proposed course in Salesmanship for Foreign Trade—that of modern languages—though, let me add, I am delighted also to see prominence given in the courses to the study of English. In the specification of the qualifications necessary to efficient salesmen, which our Committee have adopted, the last paragraph reads:

> They need, perhaps most fundamentally of all, knowledge of their own and other languages, especially of how to use those languages most effectively, alike by the written, the printed, and the spoken word.

While in no way depreciating the value of knowledge of foreign languages, I would lay stress also on the value in commerce of proficiency in our own. The following passage from John Locke's "Some Thoughts Concerning Education," in which I have substituted the words "business man" for "gentleman," is as apt to-day as when it was written 250 years ago:

> To write and speak correctly gives a grace, and gains a favourable attention to what one has to say; and, since it is English that an English business man will have constant use of, that is the language he should chiefly cultivate, and wherein most care should be taken to polish and perfect his style. . . .
>
> Whatever foreign languages a young man meddles with (and the more he knows the better), that which he should critically study and labour to get a facility, clearness, and elegancy to express himself in, should be his own; and to this purpose he should daily be exercised in it.

With regard to the important subject of foreign languages, of our shortcomings in that respect it is hardly necessary to give evidence, for it is a matter almost of common knowledge, sometimes even a subject of more or less shame-faced insular boasting—boasting that is a relic of the bad old days when everybody not a Britisher was to us a "damned foreigner." But our ignorance of foreign languages is indeed a subject not for boasting or jesting, but for serious self-criticism, and early and efficient action.

Commenting generally on the evidence he had quoted, Mr. Goodenough concluded:

A MATTER OF POLICY.

It is time we set to work "to consider the problem of education for salesmanship," and, in so doing, to bear clearly in mind that salesmanship—which is only the essence of commerce under another name—is a function of the entire business organization. The efficiency or otherwise of salesmanship in a firm is a question of direction (the laying-down of policy) and management (the organizing and supervision of the execution of policy), as well as of the actual operation of selling, which can only be carried out on the lines of policy laid down by the board, and by the methods devised and approved by its sales manager. Education for commerce is not merely or mainly education for accountancy, banking, insurance, or shipping, any more than it is merely or mainly education for shorthand, typewriting, or office methods. They are nothing but the tools, the machinery, the ways and means of commerce—all important and necessary in their place, but incapable alone of ensuring the victory of commerce in the markets of the world. The most important, urgent need to ensure victory is wise strategy based on knowledge and imagination and put into effect under sound, efficient generalship.

WORK OF THE BIRMINGHAM COLLEGE OF COMMERCE.

There are many British firms whose salesmanship is above reproach, and is an example to the world; and their business flourishes accordingly. But there are all too many who have concentrated their thought and energy upon efficiency of production, which they have raised to a high standard, and have failed to realize that in this highly competitive and busy age customers are less likely than in former times to seek the producer, who must for himself search out and study and cater scientifically for the markets he can serve. I congratulate the Birmingham College of Commerce on their appreciation of the need for education for salesmanship, and on their enterprise in attempting to supply it; and I commend that enterprise to the whole-hearted support of hard-headed Birmingham. Money spent on education for commerce well devised, well organized, and well staffed—a point of the greatest importance—is money not so much spent as invested, and the dividends that will accrue will be large beyond present conception.

THE DRY QUENCHING OF COKE.

By D. W. WILSON, Vice-President, Dry Quenching Equipment Corporation, New York.

[From a Paper before the Second International Bituminous Coal Conference, Pittsburgh, Pa., Nov. 19-24.]

All methods of high-temperature carbonization of coal, except the continuous vertical retort, involve as a necessary part of operation the discharge of coke at a temperature of from 1750° Fahr. to possibly 2150° Fahr.

Let us examine the potential benefits involved in saving the heat in this coke. Careful investigations have established the average specific heat of coke from 1800° Fahr. to usual atmospheric temperatures to be about 0·36.[1] This figure varies somewhat with the properties of the particular coke being considered, but this may safely be used as an average.

The production of steam represents a suitable and convenient means for the use of this heat. Steam represents a lower priced form of energy than coke oven gas, but heat recovery in the form of coke oven gas is not practicable. The problem, then, is that of some type of waste-heat boiler by means of which the sensible heat of the coke may be converted into steam. It should be noted here that this type of waste-heat recovery differs radically from the usual installation. Ordinarily, as in the cases of open hearths, heating furnaces, kilns, water gas machines, and the like, the stack gases from the main producing unit pass through the waste-heat boiler. Consequently draught conditions, and, therefore, combustion of the furnace proper, may be seriously affected by the operation of the waste-heat unit. This means that operating conditions as to capacity, and sometimes other factors, may be deeply influenced by the waste-heat boiler installation. In coke dry quenching, these considerations do not apply, since the waste-heat recovery deals with the coke after it is discharged from the ovens; and therefore this process in these respects is wholly independent of the coke oven operations.

Dry quenching consists of devising a simple, practical, and economical means of transfering the sensible heat of the hot coke into steam. Various schemes have been proposed, and many patents have been issued. In some plants, advantage is taken of the radiant heat of the coke, while in others the heat is transferred first by passing hot gas through the coke, then by passage of this hot gas through boiler tubes, converting it into steam. Some schemes transfer heat from the coke to steam by a combination of radiation and hot gases. Some methods involve movement of the coke, while others do not. Several technical papers have been presented covering the different processes and the results obtained from them. Perhaps the most valuable among these are the ones by Leather,[2] by Beebee,[3] and by Sissingh.[4] The process which has so far found greatest commercial favour is that devised by Sulzer Bros., of Winterthur, Switzerland. Fundamentally, this consists in passing a stream of inert gases upward through a considerable body of hot coke; the hot gases passing through or around boiler tubes, and thence to a fan by means of which they are again returned to the coke. This scheme involves elevating the hot coke if the plant is placed above yard grade, or elevating the cold coke if the plant be placed below ground elevation. It has the important advantage of counterflow of coke and circulating gases. Inasmuch as this process is the only one to have attained commercial success in this country, discussion in this paper will be confined to results obtained from it.

CLASSIFICATION OF DRY QUENCHING.

A consideration of dry quenching may conveniently be classified into two divisions: First, its technical and operating aspects, and secondly, its economic aspects. Considering the technical side of the question, we may divide it into two classifications: The heat efficiency and steam production, and coke qualities resulting from the process. The most comprehensive way of studying the heat economy is by means of the heat balance. In Table I. is given a summarized heat balance showing the performance of the dry quenching installation at Rochester, New York.

It is of interest to know the general operating conditions as to gas temperatures, coke temperatures, steam production, and similar information; and therefore Table II. is given to summarize these.

In Table I. the heat obtained by combustion of the volatile matter of the coke is obtained from a knowledge of the reduction in volatile in the coke resulting from dry quenching. Many tests at Rochester have shown this to average 0·6 p.ct. This de-volatilization occurs mainly in the coke from the ends and top of the oven, where there is some tendency toward undercoking. Consequently, this reduction in volatile produces a more uniform coke, and in this way is a considerable benefit. While it is not possible to determine exactly how much heat is contributed from this source, taking the reduction in volatile as 0·60 p.ct., and the heating value of it as 16,000 B.Th.U. per lb., we arrive at the figure of 190,000 B.Th.U. per ton of coke, as given in Table I. Admittedly the figure of 16,000 B.Th.U. per lb. is an estimate only; but remembering that carbon has a heating value of 14,500 B.Th.U. per lb., and that this volatile matter contains considerable hydrogen, it is entirely reasonable to expect its heating value to exceed that of carbon. The point might be raised that, if air be available for combustion of volatile matter, then coke combustion is probable. In answer to this, we may say that air for combustion of this volatile enters the dry quenching system at the top of the coke container, and therefore just previous to the entrance of the gases to the boiler. Observation shows that the combustion occurs only when the charging cover is open for admission of coke, and that this burning takes place almost entirely within the dry quencher, and not, as might be thought, into the air above the charging opening. Furthermore, all the oxygen in this air is consumed before the gases leave the boiler; and therefore no coke combustion can possibly occur. Repeated gas analyses have shown that, at the point of entrance to the coke, the oxygen content is negligible, and that the gases due to the percentages of carbon monoxide and hydrogen should be considered reducing rather than oxidizing. In Table II. is given a gas analysis showing its composition at the point of entrance to the coke.

One important consideration in dry quenching is the question of coke dust. This is a twofold problem: First, the circulating gases carry with them fine coke which necessitates proper divisions, that this shall not interfere with the proper functioning of the plant. In order to provide for this, dust chambers are installed in which gas velocities are reduced in order that the fine solid material may separate. Efforts in this direction have been entirely successful, and no difficulty is experienced on account of dust interferences to gas flow. The second problem with regard to coke dust depends upon the fact that absolutely dry coke, such as results from this type of quenching, is extremely dusty, rendering working conditions difficult, and, in the case of domestic coke, giving rise to customers' complaints. Under many conditions, absolutely dry coke will be sufficiently desirable to offset the dust advantage; however, it is entirely practicable, and, in many cases, common practice, to sprinkle the coke as it issues from the dry quencher with a small and controlled amount of water, thereby eliminating any coke dust. In using water in this way, it is not necessary to add a measurable percentage of moisture to the coke unless this be desired. It is possible to get away from coke dust production by the use of water, and at the same time the moisture percentage in the large coke will not be measurable, and in the coke breeze will not exceed 2 to 3 p.ct. This may be contrasted with coke breeze moisture percentages from ordinary wet quenching operations of from 12 to 18 p.ct. It is desired to emphasize that the use of dry quenching permits, if desired, the production of an absolutely dry coke, and that in any event the moisture content of the coke may be held uniform at any desired figure. Low, controllable, and uniform coke moisture is a distinct advantage, and should be contrasted with the variable moisture content from large to small coke, and often from one part of the quenching car to another, which necessarily results from wet quenching.

ELIMINATION OF WATER.

Another operating advantage in most plants, enjoyed by dry quenching, is the elimination of the quenching water.

Turning now to the second technical aspect of dry quenching—that is, the resultant coke qualities—we find several interesting considerations. First, as to the effect on coke structure, European experience has indicated that the result of suddenly spraying water upon the hot coke was weakness of structure due to sudden stresses established in the coke piece by rapid contraction. American experience, however, seems not to have borne out this idea.

Another point of importance is with regard to coke breakage due to dry quenching. As may be observed from the description already given, the dry quenching process involves more handling and more movement of coke than is the case with wet quenching. Experience in the United States has positively shown that the result of this additional handling is that, at the coke oven plant itself, dry quenched coke is smaller than wet quenched, though this reduction in size may, if desired, be made small by the most suitable design of coke handling apparatus. On the other hand, this smaller coke is more uniform in size, physically stronger, and consequently much more resistant to further handling.

Let us turn now to the various uses to which coke is put, and examine each of these in the light of the properties just described, and also with respect to such experience as is available.

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[1] "Studien uber die spezifische Warme von Koks und einigen Kohlen, stoffmodifikationen," by Paul Debrunner. "Monats-Bulletin des Schweiz-Vereins von Gas- und Wasserfachmannern," Jahrgang, 1924.

[2] "Coke Cooling," by John P. Leather, "GAS JOURNAL," June 22, 1927.

[3] "Experiences with Dry Quenching Coke Plant at Rochester, N.Y.," by A. M. Beebee, "Gas Age-Record," March, 1927. "Advantages and Disadvantages of Dry Quenching of Coke," by A. M. Beebee, "Gas Journal of Canada," August, 1927. "Economies of Dry Quenching Coke by the Sulzer Process," by A. M. Beebee, Paper at A.S.M.E. Fuels Division Meeting, St. Louis, Oct. 10-13, 1927.

[4] "Trockene Koksloschung auf dem Gaswerk zu Rotterdam-Keilehaven," by M. C. Sissingh, "Das Gas- und Wasserfach," Dec. 22, 1923.

Principally, coke is used in the following ways: (1) As water gas fuel; (2) as producer fuel; (3) as blast furnace fuel; (4) as domestic fuel; (5) for foundries; (6) in industrial furnaces; (7) in boilers.

Careful comparisons have been made at Rochester, N.Y., between dry and wet quenched coke for use in water gas machines. Several tests have shown that about 5 p.ct. better fuel economy is obtained when dry quenched fuel is used. It is difficult to give a satisfactory theoretical explanation of this, since it is impossible to account for the better performance on the basis of the heat required to drive off the higher moisture content of the wet quenched fuel. The statement has been made that the absence of moisture permits an extension of the reducing zone in the water gas machine, and consequent fuel economy. It may be that this explanation is correct, but sufficient experimental evidence is not yet available to enable a conclusion to be drawn. It is possible that the better screening, the more uniform size, and the physically stronger coke permits a more regular operation of the water gas machine, and that this accounts for the better results obtained.

Experiences involving the use of dry quenched coke as producer fuel also show definite economies amounting to a lower fuel consumption by 10 lbs. of carbon per ton of coal carbonized, when dry quenched coke is used. This, then, represents about 5 p.ct. better economy. Here again, no satisfactory explanation seems available, though there are several possibilities.

For blast furnace fuel, unfortunately, no American experience is available. However, several factors have an important bearing upon this. The coke moisture from the dry quenching operation may, if desired, be held at zero. Usually, however, some water will be used. In any event, the resulting moisture in the coke will be very low, and always will be practically uniform. It is believed that this uniformity of moisture should be of prime importance in blast furnace operations. Furthermore, the uniform size and greater physical strength of the coke should lead to better furnace operation and lower fuel requirements. The economies effected in water gas machines and in producers would lead to the conclusion that some similar blast furnace economy should be inevitable.

Considered from the standpoint of domestic fuel, there are important points in favour of dry quenching. An advantage which has definitely proved itself is that better screening is possible, and therefore a cleaner coke, freer from breeze, may be supplied to domestic customers. Precautions must be taken to avoid supplying to the domestic trade coke which is so dry as to be dusty, and this is true whether wet or dry quenching be practised. This need not occur in dry quenching provided adequate water be added to the coke after screening and before supplying to the customer, thus retaining the advantage of the better preparation of the dry coke, and eliminating wet breeze adhering to the larger coke. Statements have been made that moisture cannot be added to cold coke so that the latter will retain it, and therefore keep down dust as well as can be done during wet quenching. Experiments made at Rochester have, however, shown that there is no difference in the capacity of coke to add moisture, and in its retention of it, whether wet quenching or dry quenching be practised. It would seem, then, that the use of dry quenching with regard to domestic coke has no disadvantage, provided sufficient moisture be added to the coke to prevent dust difficulties, and that it offers the important advantage that a cleaner coke freer from breeze may be supplied.

For use in foundries, in case especially large coke is essential for a particular purpose, it is probable that the dry quenching process would be at a disadvantage, as it certainly tends to produce coke smaller than the wet quenched product. However, it would seem that, for most cases, dry quenched coke would offer advantages, in that its moisture content should be less, and that it would be more uniform in this respect. Also the greater physical resistance of the coke to handling should be of great assistance to the foundryman.

With respect to use in industrial furnaces, little can be said except what has already been given. It is particularly difficult to give anything of value here, because requirements for industrial furnaces differ so widely from one case to another. However, it would seem there would be an advantage in having a stronger, cleaner coke with low uniform moisture content.

For use in boilers, ordinarily only breeze and the smaller sizes of coke find an outlet. Coke breeze from dry quenching will usually contain not more than 3 p.ct. moisture. The advantage which this product has over the wet quenched is apparent when one recalls that ordinarily wet quenched breeze contains from 12 to 18 p.ct. moisture, all of which requires heat to evaporate it. Furthermore, the use of heat for this evaporation reduces furnace temperatures, and thereby impairs heat transfer from the combustion zone to the boiler tubes.

Turning now to the economic side of dry quenching, important advances in this respect have been made in the last few months. One of the chief costs of dry quenching has been the fixed charges on the necessary investment. Recent tests at Rochester, N.Y., have shown that by slight modifications of the apparatus very great increases in capacity are possible. It is proposed to give here the costs and the revenues from steam only, to be expected, based on recent experience, in a plant handling in one unit 3300 net tons of coke daily. Additional revenue will be obtained from the higher quality of the coke, as experience cited earlier in this paper demonstrates, but this is so dependent upon local conditions that it is not attempted to include it. It is of interest to note that the ground area required by this plan is about 60 ft. by 60 ft., and that it may be located anywhere along the quenching track. These figures are summarized in Table III.

Steam Produced.

Based on 1850° Fahr. coke as pushed and with an ash content of 9 to 10 p.ct., and volatile of about 1 p.ct., a total steam production of 950 lbs. per ton of coke may conservatively be expected. Reference to Table II. shows that at Rochester slightly more than 1000 lbs. per ton of coke are actually made. In Table III. it is assumed that the circulating gas fans would be driven by condensing steam turbines. If electric power be sufficiently cheap, this, of course, would not be done. As will be shown below, about 110 lbs. of steam per ton of coke will be required to drive the turbines, leaving, therefore, 840 lbs. per ton above turbine requirements.

To allow for boiler inspection and plant maintenance, it is assumed that there will be 350 days' operation per year. This is a conservative estimate, as it should be possible to have the plant out of operation only one week per year. Experience has shown that one operator per shift is sufficient to take care of a dry quenching plant of this size. This is taken at 2s. 1d. per hour, as given in Table III.

Maintenance.

Experience at Rochester has shown that, due to the absence of water, and rapid heating and cooling, maintenance of the hot car is greatly reduced; also, for many plants, due to the location of the dry quenching equipment, less travel of the quenching car will be necessary. Furthermore, the quenching car is required only long enough to dump its load into the bucket of the coke elevating equipment. For this reason more ovens may be handled per day per quenching car. In a large plant, this would probably result in the use of fewer quenching cars. Also, no quenching water is required. This represents an economy in power charges and in maintenance of necessary pumps, pipelines, automatic valves, sprays, and similar equipment.

The best experience, available to date, indicates that, after allowing for these reduced expenses, an additional charge of ¾d. per ton of coke should be made to cover necessary dry quenching maintenance.

Power.

Electric power will be required for the coke elevating and handling equipment, and also certain lighting charges must be made. A liberal figure is 0·4 KW.-hour per ton of coke cooled. Taking this at ½d. per kilowatt-hour, the figure of £950 per year is obtained as given in Table III. For a plant of this size, it is estimated that about 1100 H.P. would be required to operate the fans. Furnishing this power by means of a part of the steam produced from dry quenching, it seems, is the most economical method for a plant of this size. Taking 14 lbs. of steam per H.P., which is easily obtainable in a condensing turbine, it is found that about 370,000 lbs. of steam per day will be necessary. This is equivalent to 110 lbs. of steam per ton of coke cooled, which was the figure used above in arriving at the net steam produced. For such a turbine, condensing water, however, is necessary. This is taken at 800 galls. per minute, and a cost of ½d. per 1000 galls. is used to cover the pumping of this water. Using these figures then, a total charge for condensing water of £414 per year is arrived at. The cost per 1000 lbs. for the steam produced in excess of the plant requirements then becomes 1½d.

Fixed Charges.

The cost of installation of a plant of this size has been rather carefully estimated, and works out at about £108,470. If fixed charges be taken at 16 p.ct. annually, the yearly charge then due to this item becomes, as given in Table III., £17,335, or is equivalent to a charge per 1000 lbs. of steam of 4½d. The total cost of steam, therefore, including 16 p.ct. fixed charges, becomes 5¾d. per 1000 lbs.

Table I.—*Heat Balance: Dry Quencher.*

Basis 1 net ton dry coke, 32° Fahr.

—	B.Th.U.	P.Ct. Total Input.
Input—		
Sensible heat of coke	1,288,000	79·0
Heat in feed water	153,000	9·4
Combustion of coke, volatile matter	190,000	11·6
Total	1,631,000	100·0
Output—		
Steam	1,217,000	74·6
Sensible heat of coke	325,000	19·9
Radiation and convection	49,000	3·0
Unaccounted-for	40,000	2·5
Total	1,631,000	100·0

TABLE II.—*Operating Data: Plant Operating at 540 Tons Coke Daily.*

Coke temperature—	
Inlet	1780° Fahr. heat content—634 B.Th.U. per lb.
Outlet	600° " " " —160 " " "
Steam—	
Pressure	140 lbs. per sq. in.
Quantity	1005 lbs. per ton of coke
Temperature	361° Fahr.
Feed water—	
Temperature	182° Fahr.
Circulating gases—	
Temperature—	
Inlet boiler—	
Maximum	1300
Minimum	980
Average	1140° Fahr.
Outlet boiler	360° Fahr.
Volume	20,000 c.ft. per minute at 360° Fahr.
Pressures—	
Fan inlet	−2·8 in. water
Fan outlet	+4·8 " "
Analysis (entering coke container)—	
CO_2	10·0 p.ct.
O_2	0·1 "
CO	6·0 "
H_2	6·0 "
N_2	77·9 "

TABLE III.—*Economic Statement: Plant Capacity, 3300 Net Tons Coke Daily.*

[All figures based on one year's operation.]

Steam produced—	
840 lbs. per ton above requirements of condensing turbines driving circulating gas fans.	
840 × 3300 × 350 = 970,000,000 lbs. per year.	
Expenses—	
Labour—	
One man per shift at 2s. 1d.	£909
Maintenance (credit reduced maintenance on hot car and no quenching water)—	
¾d. per ton more than above credits.	
¾d. × 3300 × 350	3595
Power—	
Hoist	950
Water	434
	£5888
Cost of steam per 1000 lbs. (exclusive of fixed charges)	1½d.
Fixed charges—	
16 p.ct. of £108,470	£17,335
Cost of steam per 1000 lbs. (fixed charges)	4¾d.
Total cost of steam	5¾d.

THE RADIATION OF HEAT FROM GAS LIGHTING BURNERS.

H. J. HODSMAN, M.B.E., M.Sc., F.I.C.

[A Paper before the Yorkshire Junior Gas Association at a Meeting at Leeds University on Dec. 15.]

There is probably no one here who believes that the future expansion of the gas industry will be made in the field of lighting. This belief may be the cause of the decline of interest in the scientific study of gas lighting problems noticeable in recent years, which is probably a mistake, for much gas lighting is practised, and will probably continue in fields for which it is specially adapted. It is, therefore, desirable to have available information about the special characteristics of gas lighting burners, as distinguished from other illuminants. One special characteristic is the association of great development of heat relative to the output of light. This heat sets up intensive convection currents in the air, with consequences which may or may not be desirable. Some of the heat developed may be radiated freely, contributing to the warming of the surrounding space, which will often be a desirable accompaniment of the light.

Some years ago, when information on this point was sought, none was found available. It was decided to make some measurements, which were carried out by Mr. H. H. Thomas, B.Sc., now of the Liverpool Gas Company. These are recorded later. Before doing so, I should like to draw attention to a number of considerations applicable to illuminants in general.

Nearly all commercial illuminants are in essence hot solids glowing as a result of their high temperature. The radiation emitted is composite, consisting of heat as well as light. The energy carried by the light waves is, however, only a very small fraction of the total—so small that its precise measurement is difficult. This is clearly demonstrated by the curves, showing the distribution of energy throughout the spectrum, determined experimentally by Lummer for the "perfect black body," which has the maximum radiating power (fig. 1). Lummer determined similar curves for a sheet of platinum, chosen because, owing to a high reflecting power, it has a correspondingly low radiating power (fig. 2). The interest of these curves lies in the fact that the radiation of most solids falls within the limits set by them. The wave-length is plotted horizontally, and the energy associated with each wave vertically; the vertical dotted line marking the limit of the visible spectrum—the red end. Inspection of these curves indicates the rapid increase of radiation which attends rise in temperature. Further inspection shows that the energy associated with the light waves increases much more rapidly than the total radiation. This can be seen better from Table I.

TABLE I.—*Light as a Percentage of Total Radiation.*

Temperature °C.	Black Body.		Polished Platinum.	
	Uncorrected.	Corrected for Visibility.	Uncorrected.	Corrected for Visibility.
1200	0·19	0·01	0·36	0·02
1700	1·77	0·21	2·95	0·39
2200	6·39	1·11	9·51	1·81
2700	12·86	2·96	17·56	4·39

These figures have been obtained by calculation from the spectral energy curves (figs. 1 and 2) of the perfect black body and polished platinum. Columns 2 and 4 show the proportion of the total energy radiated which is associated with the light waves (*i.e.*, 0·4 to 0·8 μ) when the temperature of the glower is as stated. Taking the maximum temperature of most commercial illuminants as below 3000°, it is obvious that the energy to be associated with the light waves emitted is only a small portion of the total radiation.

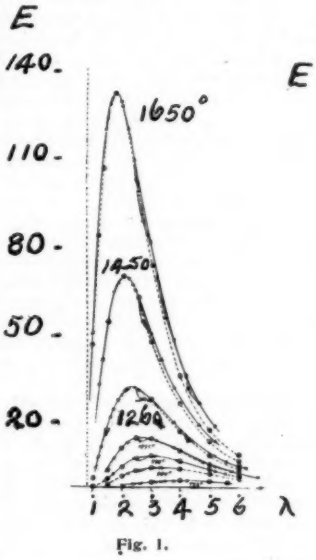


Fig. 1.

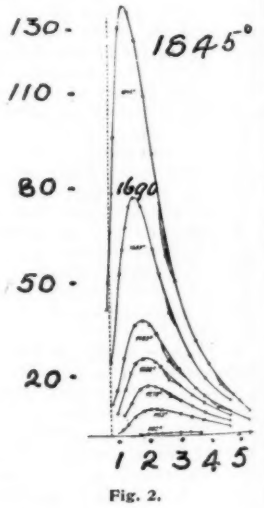


Fig. 2.

The actual position is worse than this, because all the energy of the visible spectrum is not of equal value in producing the sensation of light on the human eye, whereas in Columns 2 and 4 equal weight has been given to all waves of length between 0·4 and 0·8 μ. Energy associated with waves at the red and blue ends of the spectrum is comparatively valueless in producing illumination, whereas the eye is most sensitive to the green light in the middle of the spectrum. If the energy associated with the visible spectrum is discounted according to the relative usefulness of the light of various wave-lengths, we find that the residual useful light energy represents a much smaller fraction of the total radiation. This is shown in Columns 3 and 5. The fraction is seen to be less than 5 p.ct. for all glowers with temperature below 2700° C., and less than 1 p.ct. when the temperature is below 1700° C. If we exclude the electric arc, this range covers almost all commercial illuminants.

Inspection of these curves shows that the scope for improving the mechanical efficiency of light production is comparatively limited. It can obviously be done by heating the glower to higher temperatures or by choosing a glower which approximates more in radiating power to polished platinum than to

the perfect black body. Both methods have been adopted in the advance of lighting technology.

DEVELOPMENT OF COMMERCIAL ILLUMINANTS.

From the hydrocarbon flame to the incandescent mantle in its various developments—low-pressure gas with superheating, and high-pressure gas—the tendency has always been to heat the glowing solid to higher and higher temperatures. We cannot even now be sure that the maximum is reached, but we can be sure that even a small increase in the mantle temperature, if practically feasible, will markedly increase the efficiency of the illuminant. The recent development of superheating burners has exemplified this.

Electric light production has been following a parallel path in seeking to obtain ever higher temperatures in the glowing filament. In this respect the metal filament marked an advance on the carbon filament lamp, and more recently the gas-filled lamp made still further progress. The principal merit of the latter has been the use of a gaseous atmosphere which makes it possible to maintain higher filament temperatures and so reap the advantages associated therewith. It would be possible to heat the tungsten filament to still higher temperatures and to carry the process further, but the limit is set here, as with the incandescent gas mantle, by the properties of the materials, which enforce some sacrifice to maintain a reasonable working life of the lamp.

SELECTIVE RADIATORS.

Though the increase in temperature of the glower affords a sure method in improving the duty of an illuminant, great advantage has been gained by the happy choice of the material of the glower. This applies equally to the Welsbach mantle and to the metal filament electric lamp. The figures in Table I. show that, at the same temperature, platinum emits a larger proportion of useful light rays than (say) carbon. Thus at 1700° C. the proportions are 0·39 p.ct. and 0·21 p.ct. respectively. Substances, such as platinum, which radiate light preferentially, are often described as selective radiators. Obviously it is advantageous to utilize such bodies where possible. The tungsten metal and the Welsbach mantle are both examples of materials which have these characteristics well developed. Indeed, the Welsbach mantle mixture is remarkable for the high proportion of its radiation emitted as light, and at the same time the lowness of its capacity to radiate heat. It is just this poor capacity for radiating heat which assists the attainment and maintenance of a high temperature of the mantle in the flame, and, as a consequence, of a high illuminating power. Its properties in this respect are probably superior to polished platinum.

So far we have considered the light expressed as a fraction of the total energy radiated by the illuminant.

But the total energy radiated by the glowing body is itself only a fraction of the energy supplied to maintain its temperature. In this respect there is a marked difference between flame heated and electrically heated sources of light. The quantity of energy as current necessary to maintain the temperature of an electrically heated glower is much less than the heat energy of combustion generated about a flame heated glower. This is due to the essential difference between the internal heating and external heating in which the difficulty of transferring heat from a gas to a solid is encountered.

It is the fact that a temperature adequate for the production of a desired amount of light can be maintained by a moderate consumption of energy; and this has enabled an expensive form of energy, such as electricity, to be used for the purpose.

When the light is obtained from a flame heated glower, the local energy consumption must always be much greater. This difference is fundamental, and has its advantages and disadvantages for each illuminant, as is well known. The difference is shown by the figures in Table II., compiled by H. E. Ives. These figures show that the gasfilled electric lamps emit as light not more than 3 p.ct. of the energy supplied, whereas the corresponding figures for gas burners are only one-tenth of this.

There has been a tendency among physicists to regard the production of light without heat as an ideal of perfection. It is often an advantage to obtain light without heat. Sometimes it is immaterial; in others it is a positive disadvantage. When the heat to be obtained is in any case negligible, and the source costly, the reduction of this quantity per unit of light is an obvious advantage. This doubtless justifies the advantages claimed for the reduction of the energy consumption of electric lamps by tenths of a watt per candle.

The production of light by any flame heated glower must be associated with a tenfold liberation of heat—though, of course, this does not imply necessarily any greater consumption of fuel originally—and as this is inevitable, it would seem desirable to know what happens to this heat afterwards, how can it best be utilized. Sometimes it is actually disadvantageous, but sometimes the contrary. In many cases, the heat requirements, if not supplied in this way, must be provided otherwise.

HEAT RADIATED FROM GAS BURNERS.

Considering that more than 99 p.ct. of all the gas burnt in lighting burners is actually dissipated as heat, it invites comment that so little attention seems to have been devoted to its study. Thus the writer has been unable to find any recorded observation on the proportion of the heat of combustion of the gas which is radiated as heat, though this is obviously considerable and important in studying the application of gas for lighting purposes.

Heat radiated from the source is the most desirable form for warming a room. The rest, which is communicated by convection and conduction, is less useful; though the ventilation, which may be achieved by the air currents set up, is always valuable. The proportion of heat radiated by lighting burners, though valuable, is not easy to measure. The problem is simplified if we are content with the determination of the heat radiated downwards; convection effects being here readily excluded. It is just this portion of the heat which is of immediate use in the warming of rooms. Furthermore, this measurement lends itself to calorimetric methods in which the heating effects can be determined without the uncertainties arising with other methods which have been employed in the measurement of the radiation of flames.

EXPERIMENTAL METHOD.

A calorimeter was therefore constructed out of a length of flattened copper tubing, wound upon a wooden former. When the former was removed, there remained a vessel shaped like a bowl. The separate coils of tubing were held together rigidly by solder, though the interstices were not completely filled in. A hole remained at the centre of the base permitting the insertion of a burner tube if necessary, and also the entry of air for combustion. In this case it was covered by a piece of copper gauze to receive the radiation from above. Provision was made for the insertion of thermometers at both inlet and outlet of the coil, so that the rise of temperature of water passing through the coil could be determined. The water flow was maintained steady by a constant head device, and measured in the manner usually employed in gas calorimetry. The burner under test was placed as shown in the sketch (fig. 3), with the gallery nearly level with the top of the coil. With upright burners, the gas supply would be introduced through the bottom of the coil. The heat taken up by the water passing through the coil in a measured time gave the quantity of heat radiated by the burner. The interior of the coil was painted dead black, while the exterior was polished, to minimize radiation loss.

In making a determination, the method of procedure was similar to that employed in using the Boys calorimeter. The

TABLE II.—*Efficiencies of Present-Day Illuminants (H. E. Ives).*

Illuminant.	Commercial Rating.	P.Ct. Over-All Efficiency. $\frac{\text{Energy as Useful Light}}{\text{Energy Input}} \times 100$.
Carbon incandescent lamp	4 watts per mean hour C.P.	0·42
Tungsten incandescent lamp, vacuum type	1·25 watts per hour C.P.	1·3
Gasfilled type	600 C.P., 0·5 watt per C.P.	3·2
	500 watts, 0·7 watt per C.P.	2·4
Carbon arc—		
Open arc	9·6 amperes, clear globe.	1·9
Enclosed arc—		
Light opal inner, clear outer, and street reflector	6·6 amperes, D.C.	0·96
Enclosed white carbon arc (flame)	10 amperes, A.C.	4·3
Moore nitrogen vacuum tube	220 volts, 60-cycle, tube length, 113 ft.	0·85
Quartz mercury arc	174-197 volts; 4·2 amperes.	6·8
Glass mercury arc	40-70 volts; 3·5 amperes.	3·7
Nernst lamp	..	0·77
Acetylene	1·0 litre per hour consumption.	0·11
Petroleum lamp	..	0·04
Incandescent gas lamp (low pressure)	0·350 lumen per B.Th.U. per hour.	0·19
" " " (high pressure)	0·578 " " " " "	0·32
Open flame gas burner	Bray 6-in. high-pressure.	0·036

water collected during the burning of ½ c.ft. of gas at the burner was measured; and this figure, multiplied by the average corrected temperature rise, gave the heat radiated by the burner and absorbed by the water. From the meter reading and a determination of the calorific value of the gas, the total heat supplied to the burner was obtained. These two figures enabled the percentage of heat radiated by the burner and absorbed by the calorimeter to be calculated.

Special experiments were made to evaluate the possible sources of error—viz., loss by radiation and transmission of heat by direct contact of hot products of combustion with the coils.

The heat lost by radiation from the calorimeter was determined by introducing water at a constant temperature not

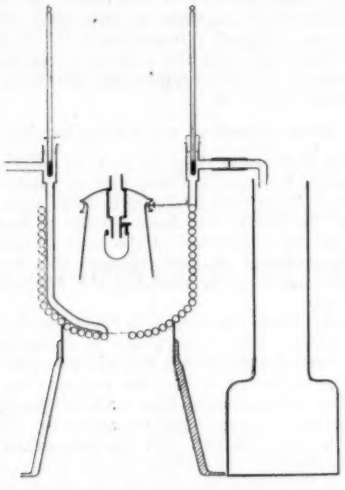


Fig. 3.

lower than the maximum outlet temperature attained during the experiments; the thermometer readings being taken at regular intervals, when no burner was alight in the calorimeter. Air temperature = 17° C. Water passing = 0·325 litre per minute.

Readings of inlet and outlet thermometers taken at half-minute intervals during 10 minutes.

Average inlet temp. . . . . = 21·85° C.
,, outlet ,, ... = 21·79° C.

Fall . . . . . = 0·06° C.

Inlet temperature = 4·85° C. above air temp.
∴ loss by radiation, &c. . . . . = $\frac{0{\cdot}06 \times 100}{4{\cdot}85}$
= 1·2 p.ct. of the heat content of the water above air temperature.

The loss by radiation being very small, it was decided to treat the experimental figures obtained as minimum values, which would be only slightly increased by any correction applied for radiation.

Numerous samples of air were taken at positions close to the coils of the calorimeter; and their CO_2 content proved that the products of combustion were passing away without coming into contact with the coils. Contact of the products with the coils was indicated at once by the condensation of water. Experiments where this happened were discarded. The results for a variety of typical burners are given in Table III.

TABLE III.—*Heat Radiated by Gas Burners Below Horizontal Plane Through Burner.*

Burner.	Gas Consumed. C.Ft. per Hour.	Gas Consumed. C.V. (Gross), B.Th.U.	Heat Radiated. P.Ct. of C.V. of Gas Consumed.	Remarks.
Batswing—				
Bray Reg. 5. .	6·0	465	7·1	
Bray Reg. 6. .	6·0	465	7·6	
Lab. bunsen . .	6·0	462	10·5	6 in. flame well aerated
	4·3	462	12·2	5 in. flame well aerated
Upright Incandescent Burner.				
Without chimney.	7·5	464	17·6	
	6·0	464	19·7	
With chimney. .	7·6	467	12·7	
	6·0	467	13·8	
Inverted Incandescent Burners Without Globe.				
A	6·0	479	25·5	Bottom of burner gallery ½ in. above top of calorimeter
	4·0	479	30·4	
B	6·0	476	25·0	
	4·0	476	30·1	
C	6·0	488	26·8	
	4·0	488	31·4	
D	6·0	484	27·2	
	4·0	484	31·6	
E	6·0	477	25·9	
	4·0	477	32·1	
F	7·0	477	33·8	
(cluster 3 bijou mantles)	6·2	465	33·5	
A	4·2	465	37·2	With refractory lining to burner
Inverted Incandescent Burners, with Spherical Glass Globe.				
A	6·0	479	16·2	
	4·0	479	18·4	
B	6·0	468	15·6	
	4·0	468	17·8	
C	6·0	488	18·7	
	4·0	488	19·8	
D	6·0	492	18·2	
	4·0	492	19·7	
E	6·0	475	15·9	
	4·0	475	17·8	
Inverted Incandescent Burners, with Silica Globe.				
A	6·0	463	17·0	
	4·0	463	19·9	
B	6·0	484	21·2	
	4·0	484	21·8	
C	6·0	480	22·4	
	4·0	480	26·1	
D	6·0	484	21·8	
	4·0	484	23·4	
E	6·0	477	17·9	
	4·0	477	19·1	
F	7·0	477	28·8	
(cluster 3 bijou mantles)	7·0	477	32·3	With 7 in. reflector above burner
A	6·2	469	30·8	With refractory lining to burner
	4·5	469	30·8	

It will be noticed that where these figures may be compared with other measurements—*i.e.*, on the radiation from open flames which has been measured by several observers, the results are in agreement. The low result from the fishtail burner is noteworthy.

The introduction of a refractory solid into a flame—*e.g.*, an upright mantle—increases the radiation, which, however, is diminished by surrounding the mantle by a chimney.

The radiation is still greater from inverted burners, which may differ appreciably in this respect, according to design.

Considering that the heat carried upwards in the products of combustion is often detrimental, it was attempted to see how far the downward radiation could be increased, as by lining the top of the burner with a refractory magnesia cement, when the radiant efficiency was increased to exceed 30 p.ct. Indeed, without the globe it reached 37 p.ct., thus approaching the efficiency of a gas fire.

The figure for a three-light cluster burner with superheater was 29 p.ct., and this was increased to 32 p.ct. by placing a simple disc of tinplate 7 in. in diameter over the burner.

These figures bear out the contention that the useful heating effect by the gas lighting burner is by no means negligible, and suggest that there is scope for some increase by suitable design.

In conclusion, I should like to record my indebtedness to Mr. T. Went, of the Leeds Corporation Gas Department, for rendering assistance in the provision of burners.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Discussion on Meters.

On Friday, Dec. 14, a Meeting of the Association was held in the Westminster Technical Institute, Vincent Square, S.W. 2, under the presidency of Mr. W. TREVOR KENSHOLE, of the Lea Bridge District Gas Company. A paper on the evolution of the gas meter from the earliest days of the industry to the present time was read by Mr. A. T. Gilbert, of the firm of Messrs. J. H. Robinson & Co., Ltd.; and the lecturer not only had a series of interesting lantern slides illustrative of his remarks, but gave a practical demonstration of the loss of pressure in meters of different types, and showed many models, including one based on Clegg's first wet meter, and also Defries' dry meter of 1846.

The PRESIDENT, in introducing the lecturer, mentioned that Mr. Gilbert, during the past three or four months, had travelled throughout the country delivering lectures and giving demonstrations, before the staffs of gas undertakings, on the working and manufacture of the gas meter.

THE EVOLUTION OF THE GAS METER: 1815 TO THE PRESENT DAY.

By A. T. GILBERT.

Though the title of this paper heralds something of a historical nature, it is hoped that it will not be void of practical utility. When asked by your Secretary to read a paper on the subject of gas meters, I looked up the records of your "Transactions" for the past few years, and discovered that most of the more topical points of the subject had been dealt with. I therefore crave your indulgence if I give a retrospect of an industry which is nearly as old as the great gas industry itself, for the need for meters was felt as soon as the gas was made upon a commercial basis—first the station meters to measure the quantity made, and then the consumer's meters to form a basis for charge.

It must be understood that an instrument of precision, having to withstand the rough usage of a fitting staff, and then be left at the mercy of strangers for long periods of time, must pass through many stages of development. This necessitated improvements in many directions to meet the growing demands of the young gas industry with which it was linked so closely, and whose destiny was equally uncertain.

It is difficult for us, in these enlightened days, to visualize the state of affairs in the early days of the distribution of gas. Some of your number who can look back on more years than I can, may remember when gas distribution was totally different from what it is to-day; but no one living remembers the first quarter-century of gas selling. We get a glimpse of the state of things when we come across such statements as the following, which is an extract from a patent specification dated 1824 and taken out in the name of Sir William Congreve. It is stated, in the preamble to the specification: "No meter is necessary for supplying any building (which from the subtil nature of the gas, and from the small quantity used, as well as the trifling pressure, has hitherto been found too nice an operation). Therefore," he considers, "all that is necessary is to place a cock at the entrance of supply; the cock to have a known aperture which will deliver a certain quantity at a given pressure."

The records extant are of such an incomplete nature that, with but a limited time for research, it is difficult to follow the exact sequence of the various designs and improvements; but they are presented in their order of historic importance, as they bear relation to the development of meter design.

While tracing these things, one is impressed by the number of worthless inventions and so-called improvements [some of which were shown later]. On the other hand, one notices a decided amount of diligent application on the part of inventors to improve their original designs and perfect their inventions; and many of these have survived, practically unaltered, until to-day.

1815.

Our history begins, as near as possible, with the first volumetric wet station meter by Samuel Clegg, in 1815, who saw the necessity of measuring the gas which he manufactured, and took out under one fee Letters Patent for a whole gas-making, purifying, and storing plant, and two volumetric meters—an achievement which would be impossible now, for the Patent Office would rule that a fee and separate patent would be necessary for each of the items mentioned above.

Both meters mentioned in the specification consisted of a hollow drum having a smaller drum or cylinder (about half the size of the outer one) mounted in the centre to form an annular space which was divided by two vanes into two compartments in the one case, but by three vanes into three compartments in the other. Here their similarity ends; and the two must be described independently.

The first meter was very simple indeed—so simple that it seems possible that it may have refused to work under conditions of low pressure (which we are inclined to think was most prevalent), and to pass gas, but cease to register, on a low rate of flow. The drum described was enclosed by solid ends, and was, therefore, self-contained; the water rising inside the drum only to a height just above the smaller cylinder. It was not intended that it should be submerged in an outer casing containing water.

The meter was supported by suitable framing, which carried the hollow shaft or spindle which formed the inlet to, and the outlet from, the meter. It was therefore necessary to fit stuffing boxes or other means of sealing where the rigid gas connections joined the rotating shaft. The height of the water in the drum casing did not influence the capacity of the drum; it merely formed a seal for the chambers, and regulated the flow of gas. It would be necessary, then, to find the capacity of the drum and make up suitable gearing for the recording wheel train.

As already stated, the second meter under the same date had three chambers and a complicated arrangement of spiral tubes, acting as hydraulic valves. These regulated the flow of gas and also the passage of the water from one compartment to another. In this meter (as in the last) the water level only rose slightly above the level of the inner cylinder. The shaft still acted as inlet to and outlet from the drum. The registering train was run off the main shaft as before, and the capacity per revolution was still a matter of speculation.

Clegg had the singular honour of having Letters Patent accepted under the seal of three Monarchs—George III., William IV., and Queen Victoria. In 1830 he made a meter which, to use his own phrase: "Does not work in water, and hence is not subject to the inconveniences and uncertainty of action that may be occasioned by waste of water . . . the meter operates without that resistance to the pressure of gas through it which has hitherto prevented the use of gas meters in situations where the pressure of gas in the main pipes has been very slight." In the same specifications he makes the first mention of "5-lights" as applied to meters.

In 1848 he patented an inferential meter having both a diaphragm and a liquid seal governor to regulate the gas flow "according to the well known law of statics."

1820.

In the year 1820 John Malam brought out what is referred to by some authorities as the first dry meter; but this is not strictly correct as we understand the term "meter." Malam's meter certainly had a flexible diaphragm of—to use the language of the inventor—"fine linen or silk suitably dressed;" but it was nothing more than a governor similar to that (by Clegg) just described. The rise and fall of the diaphragm caused by the demand and supply varied the opening of a valve arranged in the top of the diaphragm-plate; the gas discharging into an outer housing. Mounted upon this housing was a clockwork arrangement with its spring in tension. A lever in contact with the top of the governor passed through the housing and, when the plate rose, released the wheelwork, which could revolve and record the gas passed according to the time the valve had been opened. If the clockwork stopped, the gas was cut off. This crude arrangement was afterwards improved upon so as to vary the recorded gas flow as the pressure varied.

There was the obvious difficulty of keeping the spring always in tension, and so Malam, in 1835, improved upon his original idea by utilizing a motor in place of the clockwork. This motor was very similar in construction to the wet meter, having a number of vanes in the form of a turbine to provide the motive power. In another form of the same invention he claimed a motor having five accordion-pleated diaphragms radiating from a common hollow spindle which was fitted with valves to direct the flow of gas into the flexible chambers and cause them to revolve. This latter device may have earned for Malam the title of the inventor of the first dry gas meter. But neither of these motors was claimed as a measurer of the gas passing, but merely as providing the motive power to record the flow.

1841.

Thos. Speckston, of St. Heliers, in this year made a rotary reciprocating wet meter and a dry meter (as a matter of fact, John Malam refers to Speckston's form of meter in his specification of 1835). The specification covering these inventions contains no fewer than five separate ideas:

1. A reciprocating device in an enclosed chamber partly filled with water.
2. A rotary drum with open chambers discharging into an open casing; the supply being controlled by a central rotary valve.

3. A rotary meter, without water or other fluid, having two expansible chambers vibrating round a central valve which was operated by the ascent and descent of the said collapsible chambers.
4. Four stationary reciprocating chambers connected by racks to valves controlling the flow of gas into and from the said chambers.
5. The counting and totalizing mechanism necessary for the record of the volume of gas passed by the meter.

The claims are as follows:

(*a*) A double chamber vibrating meter.
(*b*) The mode of collapsing the expansible chambers by means of rods so that one chamber controls the valve of the opposite chamber.
(*c*) Rotary action of valves producing the registration of the volume of gas.*
(*d*) Improved counting machine.

It may therefore be stated that this was really the first practical idea for a volumetric "dry" meter, made, in a broad sense, on the same lines as the present-day meter of the dry variety.

1842.

Nathan Defries and Nathaniel Taylor filed a patent for a dry meter "having several flexible partitions for measuring gas . . . by combining several inflexible surfaces by flexible joints . . . in such a manner that they may bend." This was followed in 1846 by another, in the name of Defries alone; and these two really put the construction of the dry meter in the realms of commercial possibility.

It is interesting to note that, as one travels round the country and visits the various gas undertakings, it is common to see glass models of the meter of 1846, just as the original design by Nathan Defries. Many of the older engineers of the concerns will show these models, and refer to some near relative who received the model from the makers.

Defries was not new to the meter industry, for in 1838 he invented a very crude form of wet meter. In 1849-50 he brought out further improvements, mainly to lessen the cost of production, of his dry meter.

1846.

In the year 1846 Dickenson and Falkous (the latter a gas engineer of Newcastle-upon-Tyne) improved upon the Clegg meter by the introduction of a float to stop the gas supply to a meter if the water-line fell below a certain level, or if the water level was reduced by tilting the meter or by other means. Also, improved filling arrangements were incorporated to prevent the water being drawn off.

The prior claim of Samuel Clegg for the master patent for the wet meter was for years acknowledged (by the mention of his 1815 Letters Patent) in all the succeeding improvements which followed in quick succession. It is difficult to discover exactly when the present form of meter drum was first introduced, for during the first thirty years nearly every form of cycloidal and helical curve was tried for the position and shape of the vanes of the drum. There were also scores of patents for preventing fraudulent use of the meter; and the maintenance of a constant water-line and the prevention of freezing were also a fruitful source of invention.

1855 to 1866.

The year 1855 saw the introduction of the Saunders and Donovan "cheese section" float which varied the water displacement as the water level was lowered.

A patent was taken out by Gedge in 1856 for the fitting of a reservoir above the height of the water level, with a small aperture at that level so that, when the level fell, a small quantity would fall from the reservoir to fulfil the static law, as on the well known principle of the bird fountain. This principle has been adopted for wet meters during quite recent years.

In 1859 Humphrey patented a rotary type of meter on the Thorpe principle; and in this year the first compensating drum, by Newton, was produced before the Warner and Cowan, of 1874.

In the dry meter, too, there were dozens of so-called improvements, mostly to simplify construction, or in the distributing valves. There was one by Harmer, in 1859, for the present lay-out of valves. But many endeavoured to break away from the three or four flexible chamber type, and constructed meters with one flexible diaphragm enclosed in an outer casing, which, of course, formed two chambers; and the means of operating these was to use a valve which was thrown over by a weight, or otherwise operated suddenly.

Several inventors took out Letters Patent for meters made on the lines of cylinder and piston, but unfortunately the specifications do not state the amount of gas pressure necessary to move the meter. The year 1862 saw a meter by Brooman which rang a bell when the last burner was turned off.

* This is the first claim, as far as I can discover, for the registration of "the volume of gas" recorded.

1866.

William Payton seems to have been the first to produce a dry meter constructed as those of the present day. The familiar "bag" type of leathers was used, and the general construction was exactly similar to the present pattern of meter. Previous to this, the Defries diaphragms, made on the hinged-door principle, seemed to be generally adopted. Of course, the meter claimed here was to be made of cast iron, and the valves, of a certain semi-rotary kind, were operated by a crank rotated by the reciprocating action of the flag arms. One other interesting point of the invention was the introduction of cone seals, under spring tension, which replaced the stuffing boxes. The period 1862-63 saw stamping out case parts and banding leathers.

1874 to 1888.

The year 1874 witnessed the great improvement in wet meters for the correction of registration against the water evaporation. This was the improved meter drum by Warner and Cowan, which is in use to this day. The wet meter appears to have had a rest after this date; and inventors concentrated upon the dry meter. Both the volumetric and the inferential types fall in for a fair share of attention. In 1880 Urquhart patented the anemometer principle as applied to the gas meter. The year 1881 had many types of recording and counting mechanism, including the one which is very much to the fore just now—the "direct reading" index of the "Veeda" type. In 1884 a man named Bonna made a meter with a system of sealed bells. In 1888 we still find the door-like diaphragm, and many contrivances made without any concern about cost of production or the amount of pressure necessary to work them. Pressure was not so important in distribution practice at that time as it is to-day.

The year 1887 was another outstanding one in the history of gas. A man named Brownhill took out Letters Patent for an attachment fitted to wet meters, to enable customers to prepay for a pennyworth or a shilsingsworth of gas, "thereby enabling the gas industry to better compete with oil," and, one might add, also to compete with electricity, for at that time the young electricity industry was coming to the fore. The year 1888 saw a prepayment device for doling-out electric energy.

In 1888 Brownhill improved upon his original idea, and practically covered the whole attachment as we have it to-day. It is interesting to note that he first made the weight of the coin do all the work of moving the pawls, ratchets, and wheel train, and to open a valve; the latter being placed at the outlet of the meter. This meter was truly automatic. The second idea was to force the coin into a slot by the manual operation of a lever. This lever pushed the coin between two rollers which, through pawls and ratchet wheels, opened a valve. The meter, being thus set into motion, worked the wheels back again, and the valve closed; the amount of gas passed having been registered by the usual index train.

1889.

This year saw the improvement by Thorp and Marsh, which could be applied to either wet or dry meters. Many more followed; in fact, the number of improvements are almost legion. Many of them had a means of arresting the moving parts of the meter. In one case the inventor was optimistic enough to try to arrest the working of the meter by a stop action on the index. The "stop" prepayment meter as now in use by several gas undertakings was patented about the same period.

There was a host of patents to protect the supplier from fraud by these meters, as in the days of the first wet meter. In all cases where pioneers have brought out something good, one is struck by the stedfast application to bring the idea to perfection. One has only to name Clegg, Defries, and Brownhill as examples. The last-named worked for ten years to bring his prepayment meter to perfection, while Clegg's meters covered a lifetime of invention. In many of the designs there were more wheels and worms than was necessary—that is, judging by the very simple attachments of the present day.

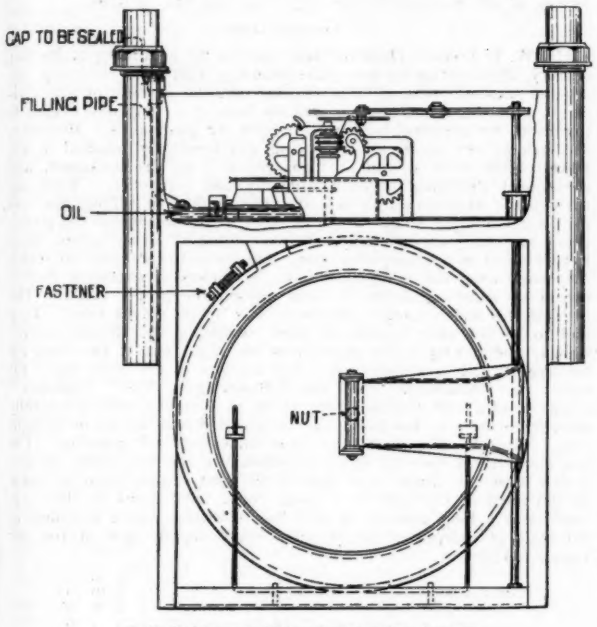
The prepayment valve came in for a fair share of improvement. Some of the valves were so uncertain in shutting-off that a pawl was arranged to rise and arrest the tangent or other working parts of the meter. For instance, one slide valve was arranged inside the valve chamber of the dry meter; the gas entering under the cover of the valve, which would surely be lifted by the incoming pressure as it attempted to shut off. Even as late as 1896 there appear contrivances for arresting the moving parts of the meter.

1895.

At this time R. T. Glover patented the side price-changer-plate meter; and this marks another of the useful steps in the evolution of the meter. To be able to alter the price, or, rather, to vary the amount of gas to be delivered for the coin, was a great advantage, for otherwise special sets of wheels making the desired combination had to be fitted into the attachment every time the price was altered. Most of the present-day meters have the change-plate system, which has been fitted to the front of the meters instead of at the side.

"Indexes" has been the commercial term for the counting

mechanism of meters since the earliest days of meters. Clegg uses the term in his specifications of 1815 and 1830; but some prefer to call them " indices " to be pedantic. These came in for a share of attention; and the " Veeda " index, of which we hear and see so much just now, and of which we are likely to see more in the future, was introduced in the early 'eighties by a man named Harling. I remember seeing some fitted in meters; but the Board of Trade refused to accept them after a while because they displayed, at certain positions, only half figures. In 1902 A. R. Beal made a double index showing the old arrangement of dials with the numerals above.



J. H. Robinson's Meter Lubricating System.

To overcome this objection, in 1904 Henderson and Higgin invented a " jumping index," but, like so many more ingenious ideas, brought nothing more to the inventors than a doubtful epitaph in the sacred archives of H.M. Patent Office Library. One can find meters which were capable of delivering complete gas bills, so that the collector could settle at once.

There was patented a meter having metal diaphragms; and in 1902 the idea was proposed of " impregnating the flexible diaphragms with a ferrous, chromous, or other metallic compound made soluble in water." But the patentees do not make any claim for increase or reduction in working pressure.

There were several meters designed on the " shunt " principle, in which a proportion of the gas was passed through the meter proper which, when the pressure fell within certain limits, opened a bye-pass and allowed a certain percentage to pass through a secondary device.

There were many forms of rotary meters of various kinds. Some worked on the exhauster principle, and others on the well-known lines perfected by T. Thorp in 1901 and later.

1920.

This year saw the introduction of one of the most important improvements of modern times—viz., the means of lubricating the slide valves under the patent of that date by J. H. Robinson. By this arrangement the valve box is converted into an oil bath, and the valves are kept free from the highly viscous deposit formed by most gases.

High-pressure distribution brought the need for meters which would register, in terms of a given standard pressure, gas passing at high pressures; and some would even compensate for temperature to a given standard. So far I have only mentioned those improvements which actually fall within the title of our subject up to the existing type and where novelty gave an excuse for departure from that principle.

Standard Meters.

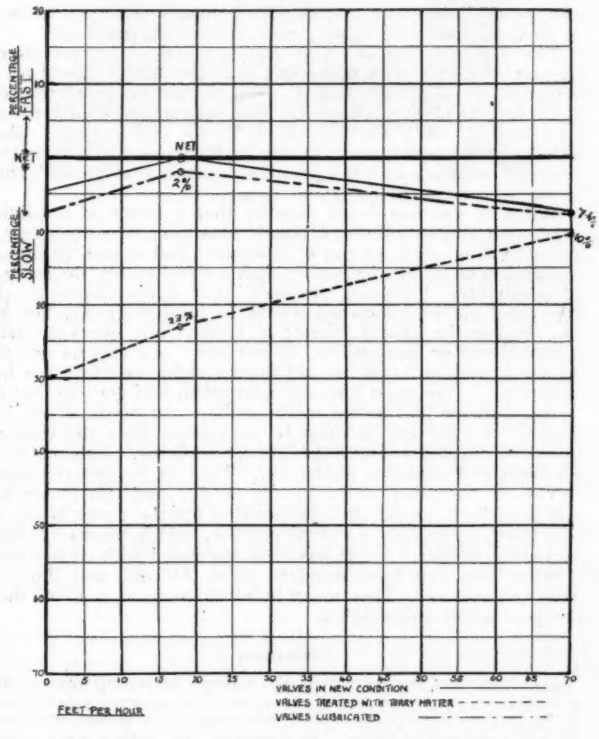
This part of my subject could be easily dismissed; but as it falls under the evolution of the meter, it must be mentioned. Most of us know how the standard meter idea was brought about. It was owing to the recognition that the gas industry was on the verge of much greater demands than ever before, and that even the " one light " consumer must feel the need of the great service that gas alone could render. It was found that when the small users also realized that they wanted more service, in most instances a new meter, generally at a greater rental, had to be installed. Therefore to assist the gas undertakings, the Life of Gas Meters Committee, which consisted of both meter manufacturers and meter users, drew up a list of standard sizes. These involved the meter makers in little, if any, structural alterations, but had one distinct advantage —viz.: It made it necessary to have all meters tested at a rate nearer to the demand expected. If a meter is supplying an appliance requiring 50 c.ft. an hour, it is better for a meter to be calibrated at 30 c.ft. or 40 c.ft. per hour than (under the old system) 18 c.ft. per hour. This, then, is a most important point; and to make it possible, the testing regulations of the Board of Trade were made more elastic, so that a meter could be stamped so long as it was accurate within the meaning of the regulation, and only absorbed a reasonable amount of pressure in working—viz., 5-tenths. Apart from this benefit, I am afraid the new order of sizes and connections were made with more consideration for economy than efficiency. However, it was a step in the right direction, and broke the long tradition of " lights " sizes (Clegg, in his specification of 1830, mentions that his " improved meter will measure . . . five lights of the kind called Argand burners ").

1922.

At least two meter makers saw the advantage of this new departure, and at once introduced meters in small cases, and badged them at the greatest capacity possible within the 5-tenths toleration. This meant a saving in space.

Your own Association has also done much to forward this movement, for in the same year I had the privilege of introducing the same at one of your meetings; and one of your Past-Presidents, Mr. S. B. Chandler, wrote, in a foreword to a text-book, " meters occupying smaller space but of greater carrying capacities have become necessary by virtue of the increasing popularity of town gas for domestic purposes."

Since then many highly-placed officials in the gas industry have advocated such meters. It is, then, evident that this type should, in time, become the meter for the industry. The capacity shown upon the badge should be the greatest possible within the 5-tenths limits; and the meters should not be subject to more than 25 p.ct. overload. I should like to say that I thoroughly endorse the remarks of Mr. R. J. Rogers, of Birmingham, when he pleads for a conference of meter makers, statutory meter testers, and representatives of the gas industry, to find a common basis for marking these meters.



Showing Advantage of Valve Lubrication: 3-Light Meter.

I hope to demonstrate conclusively the benefits of the high-capacity meter over the old " lights " and standard types, and to prove that useful pressure may be lost, and therefore revenue and efficiency, by adhering to the old patterns of meter. I shall also demonstrate by diagram and by actual test the benefit of having a system of lubrication for meters *in situ*—at little cost, but requiring a fair amount of systematic attention.

Many buyers are careful about buying high-capacity meters on the grounds of what they consider is excessive speed; but the following table, comparing the speeds of " lights," stan-

dard, and high-capacity meters may serve to eradicate any such fears.

Size.	Cap. per Rev.	Rate per Hour.	Revolutions Passing—		Rate Tested at per Hour.	Times Tested Rate per Hour when Passing 100 C.Ft. per Hour.
			100 C.Ft. per Hour.	80 C.Ft. per Hour.		
		C.Ft.			C.Ft.	Times.
3-light .	0·125	18	800	640	18	5·55
No. 1 .	0·125	30	800	640	30	3·33
5-light .	0·166	30	600	482	30	3·33
No. 2 .	0·166	40	600	482	40	2·5
10-light.	0·333	60	300	240	60	1·66
No. 3 .	0·25	60	400	320	60	1·66

High-Capacity Meter Revolutions when Passing Same Amounts.

Size Case.	Badged Capacity per Hour.	Cap. per Rev.	Revolutions at 100 C.Ft. per Hour.	Revolutions at 80 C.Ft. per Hour.	Proportion of Tested Rate per Hour when Passing 100 C.Ft. per Hour.
3-light .	150	0·285	350	284	0·533
5-light .	250	0·333	300	240	0·32
5-light .	80	0·25	400	320	..
10-light.	125	0·33	300	240	0·64

Another great objection raised to high-capacity meters is the higher rental charge necessitated by the fact that for a hundred years meter rents have been based upon capacity by lights. If the rent charges were based upon capital outlay spread over a number of years for reasonable depreciation, there would be no need for a higher rent.

Another objection to these meters has been raised on the grounds that the higher capacity is rarely needed. If that is the case, then I say frankly there must be something wrong with the sales department, for it should not be difficult to cultivate a demand for 80 or 120 c.ft. per hour in any household. Further, as I have already mentioned, the sound policy must be to have our meters calibrated at the maximum load, rather than to have them tested at a ridiculously low figure—say, 18 c.ft. per hour—and then find them several points slow at 80 c.ft., and 10 or 15 p.ct. slow at 120 c.ft. per hour.

The denomination of these meters should be "maximum capacity" rather than high-capacity. The badge should be a direction to your staff, and there should be no speculation or need for calculation about it. The instruction should be to fix a 100 c.ft. or a 200 c.ft. meter, as the case may be. But this badged amount must be the highest possible within the limits of accuracy and the 5-tenths pressure absorption. This is surely fundamentally sound.

When it was mentioned recently that a meter in a 5-light case, with all its limitations, should pass 120 c.ft. with 2-tenths pressure drop, then we can only suppose that it was meant as an ideal to be striven for rather than a thing within the realms of possibility. I repeat, therefore, that a conference of all interested parties concerned would be most desirable, but do not despise the candid friend; and when one offers to help with lectures or suggestions, do not say "our experts are all we need, and we know we are buying right—nothing else interests us." We must have an open mind, and get together to evolve a meter best suited to the commercial needs of our industry. To do this, it must be considered from the various angles of durability, and reliability for accuracy, combined with efficiency and economic production. Then let the industry say: "This is the meter suited to our needs; and this meter we will buy." It would then be possible for the meter trade to get down again to a standard practice, which means efficient and cheap production. It has been attempted with cooker production, and you have standard pipes, fittings, and flanges. Why not meters? They mean infinitely more to you, for they are your scales and weights.

Discussion.

The PRESIDENT remarked that Mr. Gilbert, in stating that to the gas engineer the meter was of the same value as were weights and scales to the ordinary tradesman, had employed a phrase which he himself had intended to use. It was clear that in these days, when they were striving to obtain greater gas consumptions in every household, unless they were prepared to fit meters of sufficient capacity, correct registration would be difficult to secure, and there would inevitably be an increase in the percentage of unaccounted-for gas. He would like to stress one point, and that was concerned with the handling of meters. Only a week ago he had seen meters handled as though they were lumps of wood, and not delicate mechanisms. No attempt had been made to pack these meters properly, which were being trundled over cobblestones. Since they realized what wonderful mechanism was inside the case of every common meter, surely it was necessary for them to ensure that all meters should be handled properly by the men. The author had mentioned the testing of meters at higher rates than were normally considered desirable; and he would be glad if Mr. Gilbert would give them his opinion as to the pressure at which meters should be tested for soundness. His reason for calling attention to this matter was that in recent years the demand for gas from the existing mains had so increased that higher distribution pressures had had to be adopted, and in many instances recourse had been made to boosting plant. Due to this, the strain on the meters might be greater. He wondered whether Mr. Gilbert was in favour of spraying meters. Recently, he (Mr. Kenshole) had been in a house where one part of the meter—which, by the way, was in a glass case—did not operate freely when all the appliances were working; slight oscillation being thereby set up. The meter had been removed, tested, and then sprayed. On replacement, the meter worked perfectly; the effect of spraying had been to restore it to its original condition. Mr. Kenshole concluded his remarks by observing that much good would result if the author's suggestion regarding a conference of all interested in the subject was put into practice.

IN FORMER DAYS.

Mr. W. J. LIBERTY (London) said that, in the beginning of the last century, illumination by gas made headway with great difficulty, for several reasons. One of these reasons was the absence of any dividend (until 1817), and another was the lack of a competent engineering head, for brewers' vats were bought for gasholders. Moreover, the lack of any means of measuring gas inevitably resulted in the abuse of the then system of "gas rental" by the consumer, and consequent ill-feeling between company and consumer. Thus the early years were very lean indeed. The method of selling gas was per burner and per hour. Then, as now, it was considered the proper thing to "do" the company. It was stated: "Every person must have noticed how shamefully many disregarded the terms on which they contracted for a supply. Some by means of excessive flames, others by suffering lights to burn beyond the proper time." The task of the undertakings' inspectors was by no means easy. They had to be out after lighting-up time, watching the shadow on the blinds, and noting if the flame was too high, and if the time for turning-off had been exceeded. The burners in use were the "rat tail," the "Cockspur," and the "Batswing." The "Cockspur" consisted of a hollow globe about 1¼ in. in diameter, pierced laterally with from three to five holes, out of which flames issued in straight jets. Naturally the combustion was imperfect and wasteful. The hot air currents gave an upward tendency to the long spiky flames, which took the shape of a *fleur-de-lys*, and caused them to curve in the form of the spur of a game cock. The flame of the "rat tail" was a long upward spike. The following was a specimen of the scale of charges of the Wandsworth Company (gas at 10s. per 1000 c.ft.):

	£	s.	d.
No. 1 Argand burner, dusk till 9 p.m.	2	10	0
,, ,, ,, ,, ,, 10 ,, ...	2	16	0
,, ,, ,, ,, ,, 11 ,, ...	3	4	0
,, ,, ,, all night	4	8	0
One jet for hall or passage, 4-in. flame	1	10	0
Sunday	0	1	6 extra

The then newly-appointed engineer to the Chartered Gas Company, however, solved the difficulty of gas measurement by designing what was now known as the wet meter. Clegg's remarkable invention was with them to-day. It was called "Clegg's self-acting gauge." Mr. Liberty observed that he had heard it called by harsher names. What Clegg did for the gas industry in inventing the wet meter, so did Col. Alexander Croll, Sheriff of the City of London, and Master of the Clockmakers' Company in the 'fifties, who was one of the founders of a rival gas company—viz., "The Great Central Consumers' Gas Company," 1856—when he invented the dry gas meter bearing his name, perpetuated by the Croll Meter Company, which was still with them under another name. Mr. Liberty said he desired to pay tribute to Mr. Gilbert for his research work in connection with the evolution of the gas meter.

METERS OF HIGH CAPACITY.

Mr. W. R. MOGER (Tottenham) then presented a written communication from Mr. S. B. CHANDLER, the Distribution Superintendent to the Tottenham District Light, Heat, and Power Company. This was in the following terms:

Mr. Gilbert's historical survey of gas meters is of particular interest in view of the importance of the subject; and the Association is to be congratulated on this valuable addition to its "Transactions." Doubt may exist in the minds of some engineers as to the wisdom of adopting meters of the high-capacity type, but I feel sure that as time goes on it will be outweighed by the general usefulness, convenience, and utility of the new pattern. One matter of importance is, of course, the ratio of size to capacity. Since the war the development of a large number of housing schemes has produced an entirely new type of dwelling which provides very little space for the reception of the meter; and this, together with the approved practice of up-to-date undertakings of installing a meter with a capacity of at least 60 c.ft. per hour, makes it desirable that the one so fixed shall occupy the smallest possible space. The requirements of the industry to-day are for a meter of small size, high maximum passing capacity, and minimum absorption, and at a price which shall compare favourably with that ruling on a "case-size" basis. These needs appear to have been fully met by the introduction of the capacity-per-hour meter.

The effect upon unaccounted-for gas of the adoption of a proper policy regarding the installation of meters of suitable capacity to cope satisfactorily with existing and anticipated output must be considerable; and though it is common to find in a very large number of instances that meters of the old type are being overworked without any apparent undue strain, and without breaking down, it must be agreed that the practice is unsound. One has only to instance the 10-light meter serving a geyser, the rated gas consumption of which is at least 120 c.ft. per hour.

The question of removing from the district meters which are too small is a serious one; and some companies are dealing with this matter by the institution of an organized exchange, following the

wise course of removing from the district all 3-light and 5-light meters, and replacing them by 10-light, No. 3 Standard, or 80 c.ft. meters. Financial considerations, of course, enter into the question; but wherever it is possible to carry out this policy, I feel sure the advantages accruing will be reflected in reduced unaccounted-for gas, and a diminution in the number of complaints from consumers.

One of the chief points to be borne in mind in connection with the placing of meters on the district is to ensure that the case of every consumer is properly considered, and his maximum gas consumption calculated, so that the capacity of the meter installed may have a load factor not exceeding 75 p.ct. to 80 p.ct. If this precaution is observed, there is no doubt as to its ultimate good effect and the absence of undue wear and strain upon the moving parts of the meter.

Apart from an organized exchange of meters to which I refer, I hold it important that each company should have a definite policy with regard to the examination—and, if necessary, the removal—of meters which appear to be either "fast" or "slow" after they have been read for account purposes. Such a policy is essential, especially when it is borne in mind that, if action is not taken directly the meter becomes vitiated, it is afterwards difficult to detect any defection.

Another point to which attention should be given—and which, I am afraid, is sometimes ignored—is the handling of the meters themselves. The greatest care should be taken by fitters and those dealing with meters to prevent their falling or being subjected to rough treatment while being transported from stores to consumers' premises, for a fall will often displace the valve guides, causing the valve to travel in a circular path and altering the timing of the valve. Also, guides may be bent, which may cause the valve to lift off the seat, and pass unregistered gas. A fall might also bend the flag wires, owing to the overhanging weight of the diaphragm. Care should also be exercised to see that the meter is kept in a vertical position, for when it is turned upside-down, or on its side, small particles of matter may get between the valves, causing them to lift. The subject is an admirable one for discussion; and doubtless many points will occur upon which the author will be able to throw light.

Mr. MOGER asked the author whether, when the valve was approaching or passing dead centre, there was any likelihood of gas passing without being registered.

Mr. GILBERT said how pleased he was that Mr. Liberty had taken part in the discussion, for he knew how interested Mr. Liberty was in the history of the gas industry. The reason why he (Mr. Gilbert) had not mentioned the work of Col. Alexander Croll was because he did not regard him as a pioneer. As far as possible he had spoken only of pioneers. In many instances, it had taken strangers to move in the right direction. With regard to the query raised by Mr. Moger, if the valve was at dead centre, it could not be passing any gas; and if it was moving at all, it must be registering. His firm tested their meters at a rate of ½ c.ft. per hour; and he thought that, if a meter would work round one revolution at this rate, nothing much could be the matter with it. Gas would pass if some foreign matter was on the valve seating; but it had to be remembered that something the size of a match stick (which could not remain under working conditions) must be present to pass 5 c.ft. of gas an hour. To his mind, spraying of meters was a costly operation, and the light oil was not so very beneficial to the diaphragms. Paraffin had a drying action, and the effects did not last long enough to warrant the spraying costs. The lubricating device was far more satisfactory, and far cheaper in application; but lubrication *in situ* needed organizing. It was no use unless systematically carried out. As to pressure, this was a matter for the Board of Trade to decide, for the Regulations stated that 20-tenths should be sufficient. In view of the President's remarks, this was entirely inadequate; and when one considered the graphs displayed, of tests on the same meters, with varying pressures, one was inclined to wonder if any statutory limit would be desirable for testing meters. The matter should be decided by local conditions. If the President wished to refer to the soundness test, he (the speaker) would like to state that the practice of his firm was to test all meters at 13 in. W.G., for the 50-tenths of the test regulation was entirely inadequate for most prevailing district pressures. Here again a local standard would be desirable.

VOTE OF THANKS.

Mr. R. J. PEPPER (Gas Light and Coke Company), in proposing a vote of thanks to Mr. Gilbert for his paper, referred to the "Veeda" type of meter index, which, he understood, had been used with satisfaction for several years at Antwerp, which was supplied with gas by the Imperial Continental Gas Association. The cost of this index was comparable to that of the ordinary type. And as the gas industry charged for gas by the therm, surely it was desirable to arrange for the meters to read direct in therms. Having remarked that, when one was estimating for supplies, greater attention should be paid to the restrictive effect of elbows, &c., Mr. Pepper said that every effort should be made to maintain their meters on the district in the same condition as when they were first installed; and the only way to do this was to lubricate them periodically.

Mr. M. WALKER (Lea Bridge District Gas Company), seconding the vote, asked to what degree the supply of dry gas would affect the life of the meters.

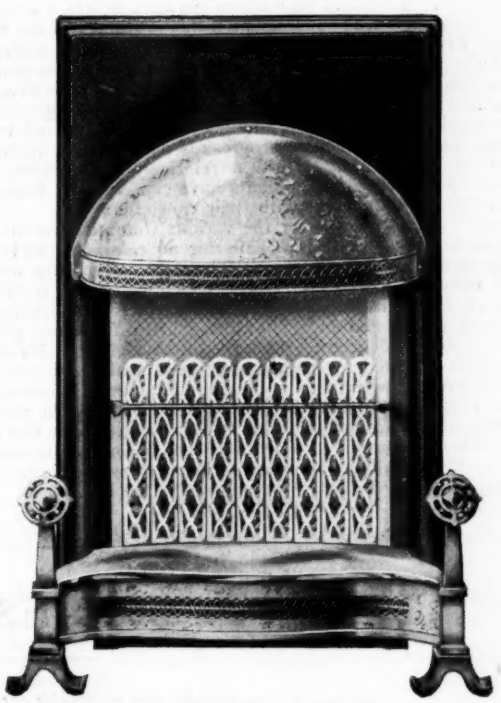
Mr. GILBERT, replying to the vote, emphasized that there was much need for enlightenment on the subject of meters. As for the therm meter, the trouble was that this was an inferential measuring device; and the Board of Trade demanded direct volumetric measurement. The effect of dry gas could not be detrimental to the life of the leather diaphragms of the meters generally. Much more harm to leathers was done by the extraction of oil, rather than the extraction of water vapour, from gas. Mr. Gilbert said he would like to thank Mr. Chandler for his valuable contribution to the discussion.

GAS FIRE PROGRESS.

From Magna Charta, through the Wars of the Roses, to the "Glorious Revolution" and beyond, history has been made in this country by the barons and their successors. We are reminded of this fact, apparently so remote from the present-day gas industry, by the latest product of the house of Main. The new "Baronial" series of gas fires by Messrs. R. & A. Main, Ltd., will again, it is suggested, make history.

CURRENT PRACTICE.

Until the appearance of this series, gas fires have relied, in their æsthetic appeal, on completely different front castings designed with a view to suiting the widely differing tastes of individuals. These different castings have been attached to standard assemblages of parts comprising the essential heating unit of the fire. Thus the burner and injector attached to a



The Romilly with No. 1 Fender.

fuel-plate carrying the brick and radiants—all assembled in a back—made up the heating unit. The different designs of fire were, as indicated above, obtained by using a different front casting in each case. Sometimes a sheathing of beaten sheet metal has been used over the casting; but the point is that in every different fire a different front casting was required.

THE NEW INVENTION.

Messrs. R. & A. Main, Ltd., have simplified this. The "Baronial" series has, in each size of fire, the same standard heating unit, but, in addition, it also has the same standard front casting. While there is on this front an integrally cast inner canopy, there is, however, no external canopy. Diversity of design to suit individual preference is ensured by providing a number of alternative outer canopies. These are all interchangeable at the works; and the particular one preferred is attached to the otherwise completely standard fire before despatch.

DIVERSITY WITH A DIFFERENCE.

To make the possibilities of this improvement plain, it may be said that the alternative canopies are made of sheet metal stampings, and that, at the moment, there are six designs. With only six designs, however, each is procurable in any of three different metals—*i.e.*, brass, copper, or pewter—and further diversity is possible by means of the different finishes that can be applied to each metal.

This is not all, for there are, in addition, four different designs of fender, two with and two without dogs. Each design is made up in the appropriate metal to match the canopy selected.

It is, perhaps, hardly necessary to add (though for the sake of completeness inquiry elicited the information) that the parts common to each size, when assembled without the external canopy, make up a fire that passes the "Lancet" test; and therefore, apart from its artistic merits and mechanical improvements, Messrs. R. & A. Main, Ltd., have in the "Baronial" fires a series that is hygienically perfect.

THE SWISS GAS ASSOCIATION.

The Schweizerischer Verein von Gas- und Wasserfachmännern held their fifty-fifth Annual General Meeting this year at Lausanne, where a large assembly of members and their friends foregathered from Sept. 22 to 24. Herr W. Grimm, of St. Gallen, the President of the Association, was in the chair. A full account of the proceedings appeared in the October number of the Association's "Bulletin Mensuel." In addition to representatives of many Swiss technical associations, there were present Dr. Schütte, of Bremen, President, Dr. Bunte, and other members of the German Gas Association, M. Laurain, of Paris, and others from the Association Technique, Director Philips, Vice-President of the Dutch Association, and Herr Budzanink, of the Austrian. Letters of regret had been received from the Institution of Gas Engineers, and from the American Gas Association.

The President, in opening the meeting, was able to refer with satisfaction to the past year's results of the gas industry in Switzerland. Sales had once again shown a welcome increase. This information was supplemented in the Report of the Committee, who were able to make the very striking statement that quite a number of municipalities, at the express demand of their inhabitants, had been reconnected to gas mains (which, presumably, they had forsaken temporarily for cheaply generated electricity). Strangely enough, in these days of trustification, much of the recent progress is attributed to decentralization of the industry "into a relatively large number of works of which the managements have consequently been able to maintain direct contact with their consumers."

Reports were presented by the various Commissions of their work during the year, which calls for no comment, as it was principally of domestic interest. The Association runs an Advisory Bureau, or "Secretariat," which is at the service of members, in much the same way as the Karlsruhe Institute of the German Association. That these institutions are greatly appreciated is evidenced by the large number of inquiries which are always reported as having been dealt with, and which in the year under review were as numerous as ever. Among the papers read on gas subjects was one by F. Gilliard and H. Haemig, of Lausanne, on their "Experiences with Continuous Vertical Retorts." Publication will follow in subsequent issues of the "Bulletin Mensuel." Excursions, in the wonderful scenery of the district, were enjoyed to the full.

WATER POLLUTION.

Report of the Water Pollution Research Board, 1927-28.

There has been published by the Department of Scientific and Industrial Research the Report of the Water Pollution Research Board for the year 1927-28.* In it, it is mentioned that the Institution of Gas Engineers set up a Special Research Sub-Committee in June, 1926, to deal with the subject of gas-works effluents. The Director of the Water Pollution Research Board (Dr. H. T. Calvert) serves as a member of this Sub-Committee. The latter, it is stated, issued a first report in June, 1927, and a second report in June, 1928. The first report contained an excellent summary of existing knowledge with reference to the difficulties caused by effluents from gas-works, and the means which are used in attempting to overcome them, together with an account of some small-scale experiments on the biological filtration of spent gas liquor at the Hinckley Gas-Works.

The Sub-Committee, the report continues, made careful investigations of the amounts and strength of spent gas liquor produced per ton of coal, and carefully reviewed various methods which are in use for preventing river-pollution from the discharge of spent liquor. The processes of gas manufacture were investigated with a view to reducing the volume and diminishing the strength of spent gas liquor resulting from gas-works' practice, and a Research Chemist was appointed to carry out a programme of research.

The second report of the Sub-Committee contains an account of work done during the past year at the Hinckley Gas-Works, where continuous vertical retorts were erected in 1923. Some successful attempts have been made to remove tar from gas in the early stage of the manufacturing operation, in order to prevent it contaminating, and thus increasing the polluting character of, the gas liquor. Experiments with several types of tar extractor have been carried out, and further experiments are planned with an electrostatic tar extractor. At the same time, small-scale experiments on biological filtration at the Hinckley Gas-Works have been continued, and the operation of a working installation of four percolating filters at the Coventry Gas-Works has been carefully watched.

* This is obtainable at H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 6d. net.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Gas Lighting Load.

SIR,—It is a heartening sign, to those of us engaged in the fight to retain the lighting load, to read in a current issue of the "GAS JOURNAL" that an effort is at last being made to resuscitate the interest in the lighting question.

For some time past the "JOURNAL" has been hammering at the wall of indifference to this matter. This wall has been steadily built up, alas! by the effort (or rather the lack of effort) of those engaged in the gas industry itself; but now it would appear that a breach has been made. This fact alone makes hope possible that it is not yet too late to recover a great deal of our losses. It means a fight, and a stern one; but it is one which is well worth while.

The Chairman of the Society of British Gas Industries, Mr. R. J. Milbourne, has in no uncertain manner added his voice to the appeal. When he says "if they (electricity) succeed, the gas industry will in a number of cases eventually lose the cooking and heating too," he echoes what we have been trying to drive home to those who have given up the lighting. If I may say so, I think that Mr. Milbourne might have made his point even stronger, without going outside the bounds of probability, by saying "in *most* cases we shall lose the cooking and heating too."

It does not need a very far-sighted person, nor one with a deep knowledge of logic, to realize that lighting stands as a barrier between gas and electricity. At the present moment lighting is bearing the shock tactics of our competitors. It may be unpalatable, but it is nevertheless true, that real, live, vivid competition has undermined the morale of a great number of our colleagues. They are shrugging their shoulders, and saying "What is the use? It has got to go." If they are right (and I most emphatically urge that they are not), why, by all the canons of ordinary common sense, help it to go? What would they think of a young man who, realizing that every year spent brought him nearer his end, said to himself "What's the use, I've got to die, so I may as well go now," and then committed suicide? That is as logical as throwing over the lighting at the present time. There are many bright years ahead yet for lighting, if it is fought for, and nourished by live propaganda, and if it is brought to the front as an integral and essential part of gas as a whole.

Lighting stands in the front of the fight. Lighting is the first thing to go. People do not have an electric cooker or an electric fire first; these only come when electricity is installed—and electricity is installed in every case first for lighting. It gets in through lighting; and it can be kept out by lighting. Ask any of our gas pessimists whether they can give an instance of electricity gaining a hold through any other channel. I doubt if they can point to half-a-dozen—or even one. Study the advertisements in the Daily Press, and you will read "Modern house for sale (or to let); electric *light* installed." In how many hundreds of advertisements has that phrase appeared! Invariably electric light—rarely electric cooking. Is not this sufficiently significant?

Efficient maintenance spells the salvation of gas lighting. The Company with whom I am engaged have for some time past had such a service; and the result is that every year our figure for hire lamps has increased. For a small sum we are installing in houses and business premises modern gas lamps; and after the installation we are inspecting and maintaining them regularly. The result is that we have retained thousands of lighting consumers—not only because gas is usually more economical, but for a far better reason, that we have kept them perfectly satisfied. Therein lies the kernel of the whole matter. Instil into the minds of the public that you are anxious and pleased to help them, and the public will reciprocate. It is useless to instal a fitting, however expensive, and leave it (and this applies to a lighting fitting particularly), for it will only deteriorate without attention, and the modern fitting will become as unsatisfactory as one of an old type. The consumer, in nine cases out of ten, cannot properly clean a gas burner, and the tenth one does not want to be worried. Hence it is essential that the Company should do the work for them. Whether this system pays or not (financially) should not enter into the question. How those stern, hard-headed business men will rend this statement! I hasten to assure them that it does pay, but I still affirm that this is not the whole essential when dealing with such an industry as gas. The fundamental principle underlying all successful business can be summed up by saying: "Satisfy your customer, and it is bound to pay." Satisfy him on lighting, and he will continue to cook and heat by gas; and in doing so he will consume gas, which is primarily all that a gas company should ask. Propaganda, however expensive, however intense, will be utterly useless without maintenance. Maintenance is essential to every branch of the gas industry—not lighting alone, though the lighting load needs it most.

Another point which our pessimists overlook is the fact that, by modernizing gas lighting, they are getting an advertising campaign

free of charge. In point of fact, the consumers are paying the gas companies to advertise their (the gas companies') production. This applies particularly to shop lighting. The consumer pays the gas undertaking to instal a gas lamp outside his premises. Primarily, of course, it is to draw attention to his shop, and does this right well; but the lamp is hung over the public thoroughfare in full public gaze. If this lamp is modern, and if it is properly maintained, it is a free and splendid advertisement for gas. People passing cannot help but be impressed by its brightness; and there is nothing to hide the fact that it is gas lighting. It is almost always urging them to instal gas. It is a strange thing, but it has been our experience times out of number that a consumer has had his gas lamps taken down from outside his premises, and gone over to our friends the enemy; but after a time the wheel has turned again, and gas has been reinstated. This happened recently at a cinema on my Company's district. High-pressure lighting was superseded by electric; but high-pressure gas lighting is again illuminating that cinema. Experience is a stern master; and experience insists upon the best. The best is gas lighting.

It may sound paradoxical, but I am afraid that the makers of modern indoor gas lamps have almost defeated their own ends, for they have striven with such success to emulate electricity with diffused lighting that it is hard to tell the difference. I have heard it said more than once, "Oh, is that gas? I thought it was electricity." It is a great pity that these lamps cannot be labelled; but as this is unfortunately obviously impossible, we must educate the public, and eradicate from their minds the electric idea (if it can be so expressed) that gas lighting is dead. If we carry on the fight for lighting with renewed vigour, we shall not only hold our own, but we shall increase our lighting load.

R. S. ROSS.

Dec. 13, 1928.

SIR,—With reference to recent views on the above subject, perhaps the enclosed photograph might be of interest, showing, as it does, one effort to let the public "see for themselves."

Photograph of Showroom Taken at 6.30 p.m. on Nov. 30.

A good show of lighting, and the slogan "Obtain, maintain, and retain," are doing much to keep sales right in this district.

ALBERT J. UNDERWOOD.

Braintree and Bocking Gas Company, Ltd.,
Dec. 13, 1928.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 12.]

Nos. 35,500—36,309.

ABERY, E. H.—"Geysers." No. 35,662.
BOARDMAN, E. E.—"Portable gas heaters." No. 36,136.
BURTON, A. E.—"Dip pipes for manufacture of gas." No. 35,629.
CLARKE, J. H.—See Abery, E. H. No. 35,662.
DENNETT, L. I.—"Electric gas lighters." No. 35,505.
GAS LIGHT AND COKE COMPANY.—See Burton, A. E. No. 35,629.
HAY, S.—See Burton, A. E. No. 35,629.
HOLLINGS, H.—See Burton, A. E. No. 35,629.
HOXLEY, H. W.—"Valves for controlling supply of gas." No. 35,659.
LAING, B.—"Gas manufacture." No. 35,893.
LEECH, W. J. B.—See Burton, A. E. No. 35,629.
MITCHELL, G. P.—"Condensers for gas plant." No. 35,832.
NIELSEN, H.—See Laing, B. No. 35,893.
PEEBLES, W. C.—"Gas governors." No. 35,971.
PEEBLES & Co., LTD.—See Peebles, W. C. No. 35,971.
SCHMIDT, K.—"Gas producer." No. 35,906.
SOUTH METROPOLITAN GAS COMPANY.—"Hot plates." No. 35,658.
SOUTH METROPOLITAN GAS COMPANY.—"Valves for controlling supply of gas." No. 35,659.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF COMMONS.

South Metropolitan Gas Company—Fuel Research.

Mr. WILL THORNE asked the Secretary for Mines the amount of the grant from public funds allocated to the Greenwich Fuel Research Department of the South Metropolitan Gas Company.

Commodore KING, in reply, said he presumed the question referred to the Fuel Research Station of the Department of Scientific and Industrial Research. The only connection between that station and the South Metropolitan Gas Company was that the former was situated at Greenwich on land leased to the Government by the Company. The estimated net expenditure from public funds at the Fuel Research Station during the current financial year was £54,000.

Low-Temperature Carbonization.

There have been a number of questions put by Captain A. Evans, Sir Robert Thomas, Miss Bondfield, Mr. Paling, Mr. Mardy Jones, and other Members of Parliament, with the object of ascertaining whether the Government were affording any facilities for the development of low-temperature carbonization systems by guaranteeing capital or in other ways. Commodore King (the Secretary for Mines) declined to add anything to the statements made by Ministers in recent debates on the mining industry, but eventually stated that the Government were not considering the question of finding capital for any particular scheme. He expressed the opinion that companies operating low-temperature processes had no difficulty in raising capital.

Safeguarding—Gas Mantles.

In reply to a question by Mr. Dalton as to the effect of safeguarding duties on prices, Sir PHILIP CUNLIFFE-LISTER said that regarding gas mantles, according to information given by the Incandescent Mantle Manufacturers' Association, prices were generally increased in 1926, but since then had been reduced. The prices of some types were now under the 1925 level, while others were a little above.

LEGAL INTELLIGENCE.

GAS FIRE LITIGATION.

John Wright & Eagle Range, Ltd., v. General Gas Appliances, Ltd.

Appeal Dismissed, with Costs.

Judgment was given in the Court of Appeal on Dec. 13 by the MASTER OF THE ROLLS and Lords Justices LAWRENCE and RUSSELL, in the appeal by John Wright & Eagle Range, Ltd., of Essex Works, Aston, Birmingham, against a judgment by Mr. Justice MAUGHAN, sitting in the Chancery Division, in favour of the defendants in the litigation, General Gas Appliances, Ltd., of Corporation Road, Guide Bridge, Manchester.

Appellants, in the action before Mr. Justice Maughan, claimed damages for alleged infringement of their Patent No. 18995, of 1913, granted to Mr. H. James Yates, for a certain class of gas fire for heating purposes. The defendants denied the infringement, alleging that the patent had been anticipated, and that it was void because of prior user, common knowledge, and insufficiency of particulars in the specification.

Mr. Justice Maughan held that the plaintiff Company's claims were too wide to be supported; and on the ground of insufficiency, in addition to other matters, he dismissed the action in defendants' favour, with costs.

The litigation, which occupied a considerable time in the Court below and on the appeal, concerned the merits of a material part of the construction of one of the plaintiff Company's gas heating stoves, which, they claimed, gave more effective radiation of heat and greater ventilation without loss of efficiency.

The MASTER OF THE ROLLS, in his judgment, said that the plaintiff's allegation was that the patent device in the specification was for an extra air passage placed under the canopy. This, it was claimed, was something new in the way of ventilation of the room, and created a great improvement. Evidence had been given at length on both sides. Mr. Justice Maughan, proceeded the Master of the Rolls, had examined the various tests, and he (the Master of the Rolls) thought the Judge was right in holding that those tests were inconclusive to prove that two air passages were substantially better than a single one equal to the two. It was agreed generally that a flue of larger area would result in larger air passage; and with this factor before him, he thought there was no invention in the design. He also came to the conclusion that there was no subject-matter in the invention. He considered the specification was couched in too wide and too general terms. Defendants objected to it on the ground that it did not state that the exit must be on a higher level than the air passage, and, further, that it did not give information of the proportions and dimensions, nor particulars with regard to the arrangement of the streams of the products of combustion. Those objections, in his opinion, were established, for, in the specification, there was no guidance given on a number of points on which it was required. In view of those conclusions, it was not necessary to deal with the question of prior user. The appeal accordingly failed, and would be dismissed with costs.

Lords Justices LAWRENCE and RUSSELL concurred; the latter remarking that he thought there was no inventive step or subject-matter in the patent.

MISCELLANEOUS NEWS.

BIRMINGHAM GAS DEPARTMENT.

Loans for Mains.

At a meeting of the Birmingham City Council on Tuesday, Dec. 11, Alderman J. H. LLOYD, Chairman of the Gas Committee, moved that the Finance Committee be instructed to apply for sanction to borrow the amount of £125,000 required for the supply of gas mains and services to March 31, 1931, mention of which was made in the "JOURNAL" for Dec. 12, p. 746. He said that building schemes by the local authorities and by private enterprise in the Department's area of supply, particularly within the city, continued to be active; and the Council would realize the large amount of work which had devolved upon the Gas Department in supplying gas to the new housing estates during the last few years. So far as the Gas Committee could see at the present time, the expenditure on new mains and services, and on improving existing supplies, would not appreciably decrease for some years to come. Since the last capital borrowing was made in this respect, about 35,000 new supplies had been given, and 165 miles of mains laid. Since the Corporation undertook their housing schemes, well over 20,000 supplies of gas had been laid on to the houses on the various estates. At the present time arrangements were being made for the laying of gas mains on several large building estates. At Northfield and Perry Barr, 8500 new services would be required, and 50 miles of mains. The last borrowing had been spread over three years; the annual expenditure being £60,000.

Dr. ROBB moved, as an amendment, that the Committee be instructed to make arrangements for the payment of the required amount out of the profits.

Mrs. LONGDEN seconded the amendment, and Mr. COX supported it.

Alderman LANCASTER pointed out that the municipality was absolutely responsible for any loss which might occur in the Gas Department, such loss falling on the Borough Fund. The amount of the Gas Department's contribution in relief of the Borough Fund was only equal to the amount the Department saved by being able to borrow under the auspices of the Corporation. They were able to borrow at a rate of about 1 p.ct. less than could a private undertaking. He wondered if the users of gas would agree with the mover of the amendment that the price of gas should be increased during the next twelve months to pay for this special expenditure.

Mr. WHITEHOUSE pointed out that the Department must have a reserve to meet contingencies.

Alderman LLOYD, in reply, reminded the Council that only two or three years ago they became alarmed at the Department's large overdraft; and he felt that the Department ought to do less in the way of paying off capital expenditure out of revenue, for it was obvious that the Council could not pay everything from that source.

The amendment was lost, and the report of the Gas Committee approved.

STOCKPORT GAS TRAGEDY.

Resumed Inquest.

Mr. R. STUART RODGER, the Lancashire County Coroner, resumed, at the Pendlebury Memorial Hall, Stockport, on Dec. 11, the inquest on the six victims of the Stockport gas-poisoning disaster—Arthur Horace Baker, aged 35, his wife, and their four children. (See "JOURNAL" for Dec. 5, p. 683.)

Mr. T. Hidderley represented the Bakers' relatives, and the Town Clerk (Mr. R. Hyde) appeared for the Corporation.

Walter Stanley Sowerbutts, Acting Gas Engineer to the Stockport Corporation, said that on the morning of Nov. 30 he examined the 2-in. cast-iron gas main opposite 71, Sheffield Street, and found that a temporary repair had been made. He found that the foundations of the house had given way, leaving a cavity 3 in. deep. The brickwork had fallen forward 1½ in., and was forced against the service pipe connected with the main. In his opinion the fracture in the main was of recent origin; how recent he could not say. He was informed that no 2-in. main had been laid during the last 20 years. He found no sign of corrosion, and he considered that the main was in very good condition.

RENEWAL OF PIPES.

Mr. HIDDERLEY: Is there any time which the Department lay down for renewals?—Whenever service pipes are renewed, and they corrode quicker than mains, the condition of the main is reported, and if it requires relaying it is done.

I suppose you will agree that cast-iron suffers from fatigue?—I have seen cast-iron pipes that have been in for 50 years.

Tom Wiggins, Gas Distribution Engineer to the Stockport Corporation, said that in July of this year a defective meter was reported at 69, Sheffield Street. The service pipe was renewed, and the main was found to be in good condition.

William Ramscar, the Corporation Building Engineer, said that the property was built about 45 years ago. In front of the house, 71, Sheffield Street, there had been a settlement allowing three courses of bricks to fall about 3 in. The settlement appeared to have been gradual; it may have been going on for months or years. The weight of the bricks which fell would be between 2 and 3 cwt.

William Newbigging, Civil Engineer, said that he found the broken main to be a perfect specimen of iron gas pipe. There were no flaws in the metal at the point of the fracture. The main had been laid in accordance with known practice. The service pipe into the house was bent. He came to the conclusion that the subsidence caused a strain to be put on the service pipe, and this strain was transmitted to the 2-in. main, and the consequence was a fracture near the socket. The fall of the brickwork, if it came with a shock, would be sufficient to put such pressure on the main that it would break. He was unable to say whether the settlement would occur when the house was built, or whether it occurred when the service pipe was put in by the Corporation. It would take very little, he said, to fracture a cast-iron main. It was not intended to stand any lateral pressure.

The CORONER: Is it possible for the sand to have been gradually carried down the slope, and the main pipe to sag gradually at that point?—No, the ground underneath is very solid.

Suppose the pipe had not been supported, would not a sag of even 2 in. be sufficient to fracture the main?—Yes.

The witness said that he thought that the pipe had been well laid, and had not subsided an inch.

PRESSURE OF SUBSIDING BRICKS.

The CORONER said that he was satisfied that the subsidence was gradual, and he asked Mr. Newbigging if he thought that the steady pressure of the bricks when applied in a lateral way was sufficient to break the pipe.

Mr. *Newbigging* replied that he thought it was. He could not give the approximate pressure without making an actual experiment.

The CORONER: The pressure from these bricks is very little?—I would not say that. It might be considerable if they came down suddenly.

The CORONER said that he was convinced that they did not. He was not satisfied with the theory altogether. He should like to have the opinion supported by mathematical facts as regards pressure, strains, and stresses.

Mr. *Newbigging*: I can make an actual trial.

The CORONER said that he was not satisfied with leaving things as they were, and he much regretted to have to adjourn the inquest. He indicated the experiments he would like to have made as to the pressure, and adjourned the inquiry until further evidence on the points mentioned could be submitted.

GAS v. ELECTRICITY.

Debate at Torquay.

The case for the alleged superiority of gas over electricity was put before a meeting of the Torquay Debating Society on Friday, Dec. 7, by Mr. R. C. Jolly. He said that coal was the source of 90 p.ct. of the heat used in this country, and the problem was how to obtain the greatest amount of energy from the smallest consumption of coal; for the time would come when the country's coal supplies would be depleted. By burning raw coal a great deal of harm was done in pollution of the air, and 75 p.ct. of the heat was lost. There were two main ways of so using coal as to avoid this—by making gas or electricity. Of the total heat contained in the coal, 82 to 85 p.ct. was lost before distribution when coal was used to make electricity. At the latest super-station the waste was 80 out of every 100 units of heat. Not only was it more economical to use coal for the production of gas than it was for electricity, but many valuable bye-products were manufactured with gas, including coke, high explosives, artificial sweetenings, perfumes, benzole, fertilizers, tar, aniline dyes, and ammonia. In the present financial position it was criminal to waste these valuable products, and in the production of electricity all of these were wasted. Mr. Jolly said that Torquay Pavilion was at one time equipped with the best electrical cooking installation; but some years ago gasfitters had to work all night replacing this with gas cookers, the electric installation being scrapped.

The case for electricity was championed by Mr. H. F. G. Woods, the Borough Electrical Engineer, who said that many electricity undertakings first distilled the coal, saved the bye-products, and burnt the gas under the boilers to make electricity. It was not true to suggest that electricity power stations were wasting coal. They burnt dross and rubbish which was not suitable for gas production, and which could not be used in any other way. At the Torquay power station at Newton Abbot they used waste from the Great Western Railway locomotives, which cost 5s. per ton. The gas interests, though they had a wonderful propaganda and publicity organization, were fighting a losing battle. They had had a 100 years' start of electricity, but they had lost the lighting business, and they were going to lose the cooking and heating. The electricity industry had been handicapped in the past by restrictive legislation, and had suffered from an ineffective sales organization, which, in fact, until recently was non-existent. Electric lighting was only forty years old, and the electricity industry was barely ten years old. What had been said about thermal efficiency was partly true, with a hidden fallacy. Gas was a fuel, not a finished article. One could buy 10,000 B.Th.U. for 1d. in the form of gas, but one could buy 40,000 B.Th.U. for that sum in coal, and still more in sawdust. Electricity, on the other hand, was not a fuel—it was heat. At Torquay they could not get electric cookers fast enough; they had 1200 out, and were sending out six per week. They had five cookers out of 250 returned because they were more expensive than gas, but three of these people applied for electric cookers afterwards, saying they were more satisfactory and cheaper. With regard to the installation at Torquay Pavilion to which reference had been made, this

was one of the first plants of its kind and was experimental. Since the gas appliances had been put in other electric cookers had been installed at the Pavilion, and there was a possibility of more going there in the future. Mr. Woods pointed out, in conclusion, that the New Torbay Hospital was electric throughout.

TEIGNMOUTH'S SCALE OF DISCOUNTS.

The Teignmouth Gas Department, of which Mr. H. Higham is Engineer and Manager, have adopted a scale of discounts. The Gas Committee considered the principle of a standing charge *plus* a lower price per therm, as well as the discount system; and they came to the conclusion that in the interests of all consumers—both prepayment and ordinary—the discount system was preferable. The basic price is 1s. per therm, with discounts (subject in all cases to payment at the end of the second month after the close of the quarter) as follows:

Accounts of over	25 therms	(5,600 c.ft.)	per quarter,	5 p.ct.	discount.
,, ,,	50 ,,	(11,200 ,,)	,, ,,	7½ ,,	,,
,, ,,	100 ,,	(22,200 ,,)	,, ,,	10 ,,	,,
,, ,,	150 ,,	(33,400 ,,)	,, ,,	12½ ,,	,,
,, ,,	200 ,,	(44,400 ,,)	,, ,,	15 ,,	,,
,, ,,	300 ,,	(66,800 ,,)	,, ,,	20 ,,	,,

This affects practically all the consumers in the Teignmouth area, and gives a price of 3s. 7¼d. per 1000 c.ft., or 9·6d. per therm, to large consumers. No difference is made for whatever purpose gas is required.

SAMPLING AND ANALYSIS OF COAL.

A meeting of the representative Committee governing this section of the work of the British Engineering Standards Association was held on Nov. 29 at the Institution of Civil Engineers, when reports from the various sub-Committees and Panels which had been studying the details of the problem during the past few months were presented.

Though Mr. Ridley Warham, the Chairman of the Sampling Committee, was not able to present any definite report, the problem, complex as it is, is being fully explored, with every prospect of ultimate success. In the meantime, certain tentative proposals for both chute and truck sampling have been put forward, and representative Panel Committees have been appointed in various districts to obtain experimental evidence regarding the practicability of these proposals, including the question of the minimum weight which should be specified for the gross sample.

The Committee have urged the Panels engaged in this experimental investigation to expedite their work, in view of the basic importance of the results.

Mr. Clay, the Chairman of the Analysis Committee, was able to report that the Panels dealing with Moisture, Volatile Matter, Ash, Sulphur, Calorific Value, Agglutination, Phosphorus, and Arsenic had all been working hard, and had made unexpectedly good progress, due to the goodwill of the members, and also to the better understanding of the problem gained through dissemination of information regarding the various methods, particulars of which had been so unstintingly placed at the disposal of the Committee.

On the whole the Technical Committee were well satisfied with the general progress so far made; and at the meeting which it is proposed to hold towards the end of February, it is hoped that the Sub-Committees and Panels will be in a position to submit definite proposals for some simple and economic national standard methods of sampling and analysis of coal, applicable to present-day trading conditions, both at home and abroad.

The question of what, for want of a better term, may be called specialized tests will also be dealt with; but they come within a somewhat different category, and the Technical Committee have thought it wise, in view of the urgency of the matter, to concentrate at first on endeavouring to obtain agreement as to the more simple tests to meet the day-to-day requirements of industry.

GAS REGULATION ACT APPLICATIONS.

DECLARATION OF CALORIFIC VALUE.

Louth Gas Light Company.—450 B.Th.U. (Jan. 1, 1929.)

SPECIAL ORDERS.

Exmouth Gas Company.

To authorize the Company to utilize scheduled lands for gas purposes, to raise further capital, to establish co-partnership, and for other purposes.

Ulverston Urban District Council.

To enable the Council to utilize scheduled land for gas purposes.

DIARIES, CALENDARS, &c.

Seasonable gifts in the form of diaries, calendars, and other office requisites have been received from the following firms:

Anglo-Scottish Chemical Company, Ltd., 20, Renfield Street, Glasgow.

Cambrian Wagon Company, Ltd., East Moors Road, Cardiff.

Colliery Guardian Company, Ltd., 30 & 31, Furnival Street, London, E.C.

Crossley Bros., Ltd., Openshaw, Manchester.

Gas Meter Company, Ltd., 238, Kingsland Road, London, E.

Lead Wool Company, Ltd., Snodland, Kent.

Salesmen's Circle, Manchester District, West Riding of Yorkshire Section.

Staveley Coal and Iron Company, Ltd., near Chesterfield.

Wailes Dove Bitumastic, Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

As was expected, there is something of a run on shipments, and many collieries are in the happy position of being pressed for urgent deliveries to complete business before the year end. The pressure is to some extent due to the bad weather of last month, and the general scarcity of boats for some time past. But it is having the effect of firming the market to some extent, and good turns are being booked into January.

A welcome innovation at the week-end has been the agreement of the teamers and trimmers at some of the loading places to work overtime on Saturdays. This is a concession which has long been advocated by the shipowners, and it should enable a good number of boats to be finished after mid-day on Saturdays, and so save week-ends that have previously been lost.

Gas coals are in improved demand, and the better sorts especially are well booked. Wear Specials quote 15s. to 15s. 3d. f.o.b., and best qualities 14s. 9d., and in some cases turns are difficult to arrange. Good seconds are firmer at 13s. 3d. to 13s. 6d., ordinary quantities being obtainable at 13s. There is rather more movement in coking coals at 13s. to 13s. 6d.; best makes being firm at the higher figure. Durham bunker coals vary; the better sorts being in brisk demand at 14s., while ordinaries are still plentiful at 13s. Screened steams of all kinds are strong. Northumberland best makes are fully stemmed to the end of the year, and firmly held at 14s. to 14s. 3d.

Gas coke continues to disappoint, and stocks are tending to accumulate. The price quoted for shipment is 19s. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas coals have been fairly easy during the past week on account of the absence of heavy weather. There is no contract business for forward delivery at the moment to give an indication of prices, though collieries anticipate a much better average next year.

Recent prices for washed industrial coal have been maintained, possibly in view of the Christmas stoppages, although many collieries are curtailing the non-working days to Tuesday, Wednesday, and Thursday of next week. The large consuming industries are now fixing contracts at figures which show an advance on last year's prices.

The colder weather and the approach of the Christmas holidays have caused house coal to be in better request, and collieries report that recently accumulated stocks are now being reduced. The public are now inquiring more for the better grade coals. Since the 1926 stoppage the secondary fuels have been in greater demand; but evidently the selected high-grade coals are now being more appreciated.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 19s. 3d. to 19s. 6d., export 16s. to 16s. 6d.; screened gas coal, export 15s. 6d. to 16s. 6d.; washed trebles, export 16s.; washed doubles, bunkers 17s. to 17s. 3d., export 15s. to 15s. 3d.; washed singles, export 14s. to 14s. 3d.; washed smalls, bunkers 13s. 9d., export 10s. 9d. to 11s.; rough slack, bunkers 12s. 6d. to 13s., export 8s. 6d. to 9s.; smithy peas, export 16s. 6d. to 17s. 6d.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 16s. 9d. to 17s. 3d., export 14s. to 15s.; screened gas coal, export 14s. to 15s.; washed trebles, export 15s. 6d. to 16s.; washed doubles, export 14s. to 14s. 6d.; washed singles, export 13s. to 13s. 3d.; washed smalls, bunkers 13s. 3d., export 10s. to 10s. 6d.; unwashed trebles, export 14s. 6d. to 15s.; unwashed doubles, export 11s. 6d. to 12s.; rough slack, export 8s. 9d. to 9s. 3d.; coking smalls, export 8s. 6d. to 9s. 6d.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 3d. to 19s. 6d., export 16s. to 16s. 6d.; cobbles, export 15s. 6d. to 16s.; washed trebles, export 15s. 6d. to 16s.; washed doubles, export 13s. 6d. to 14s. 3d.; washed singles, export 13s. to 13s. 6d.; washed smalls, bunkers 13s. 6d. to 13s. 9d., export 10s. 6d.; unwashed doubles, export 12s. to 13s.; rough slack, bunkers 12s. 6d. to 13s., export 8s. 6d. to 9s.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 13s.; gas coke, export 21s. to 22s. 6d.; furnace coke, export 19s. to 19s. 6d.; washed steam (Goole), bunkers 16s. to 16s. 6d.; Hull (West Yorks.), bunkers 17s.; Hull (South Yorks.), bunkers 17s., export 14s. 6d. to 15s.

MIDLANDS.

There has been a gradual quickening of demand for house coals of all kinds in preparation for the festive season. The trade momentum has gathered more strength in London than in the Provinces; but it is generally apparent. With ample reserves upon which to draw, pressure at the pits has not been proportionate to the seasonal broadening of the market.

Orders for industrial coal have been coming in rather more freely from works where supplies are needed to ensure continuous operation of plants after the holidays. At this time of year there is always the risk of hard weather interfering with road, rail, and water transport. Industrialists whose order books enable them to arrange output programmes for January are taking the opportunity now of making sure of their fuel supplies.

There is very little sign of strain, however, either in the market or in the distributive system. That supplies are equal, and more than equal, to the brisker demand is made plain by the dead level at which pithead prices remain. In quoting for new contracts collieries are putting on the amount of the rebate in cases where the buyer pays the toll.

For coke required for Northam blast-furnaces 14s. 6d. is asked. With the shorter haul to Derbyshire furnaces the amount involved is, of course, appreciably less. It does not appear that the dispute between the fuel interests and the iron and steel trade as to the apportionment of relief on running contracts is any nearer adjustment.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 17.

The market for pitch is quiet; but the price is unchanged at about 40s. per ton.

Creosote is steady at about 7d. per gallon.

There is a fair amount of inquiry for tar spirits, and prices are firm. Toluole, 90 p.c., is about 1s. 10d. per gallon; pure toluole, about 2s. 1d. per gallon; pure benzole, 1s. 9d. to 1s. 10d. per gallon; and 95/160 solvent naphtha 1s. 6½d. to 1s. 7d. per gallon.

Pyridine is about 4s. 6d. per gallon.

Tar Products in the Provinces.

Dec. 17.

Markets remain unaltered.

The average prices of gas-works products during the week were: Gas-works tar, 27s. 3d. to 32s. 3d. Pitch—East Coast, 36s. 6d. to 37s. 6d. f.o.b. West Coast—Manchester, 31s. 6d. to 32s. 6d.; Liverpool, 33s. 6d. to 34s. 6d.; Clyde, 33s. 6d. to 34s. 6d. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 5⅛d. to 5⅜d.; salty, 5⅜d. to 5⅝d.; Scotland, 5⅜d. to 5⅞d. Heavy oils, in bulk, North, 8¼d. to 8½d. Carbolic acid, 60 p.c., 1s. 11d. to 2s. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole . . .	0 10	to 0 10½	per gallon at works
Motor ,, . . .	1 4	,, 1 4½	,, ,, ,,
90 p.c. ,, . . .	1 7	,, 1 8	,, ,, ,,
Pure ,, . . .	1 10	,, 1 11	,, ,, ,,

TRADE NOTES.

Six-Wheeled Steam Wagons.

Messrs. Richard Garrett & Sons, Ltd., of Aldwych House, W.C. 2, have received a provisional order from Samuel Instone & Co., Ltd., of Leadenhall Street, E.C., for 100 wagons of the rigid six-wheeled type, reference to which was made among the Trade Notes in the "JOURNAL" for Oct. 10.

"Keith" Thermostat Gas Controller.

Messrs. James Keith & Blackman Company, Ltd., have published a folder dealing with the fixing and adjusting of their "K-B" thermostat gas controller. This controller is for use where it is found necessary or desirable to maintain within close limits the temperature of a fluid heated by gas. The makers claim that it will operate within 3° Fahr. of the desired temperature up to about 500° Fahr. A temperature setting dial can be provided if desired.

CONTRACTS OPEN.

Coal.

The City of Plymouth invite tenders for the supply of coal for the gas, electricity, and other departments of the Corporation. [See advert. on p. 809.]

South Suburban Gas Company's Reduced Price.—At a meeting of the Company held on Dec. 7, the Directors of the South Suburban Gas Company decided to reduce the price charged for gas in the Company's area of supply by ¼d. per therm, from and after the readings of the meters for the Christmas quarter.

Smoke Abatement Committee Visit Leeds Works.—The members of the West Riding Smoke Abatement Committee, whose Hon. Secretary is Dr. J. J. Jervis, Medical Officer of Health for Leeds, visited the Meadow Lane Works of the Leeds Corporation Gas Department, on Dec. 14, particularly with the intention of inspecting a coke-burning grate fitted with gas ignition. Mr. C. S. Shapley, the Engineer and General Manager, received the visitors, and several of the grates were seen in ordinary use in the offices at the gas-works.

Rebates at Bradford.—The Bradford Corporation Gas Committee, on Dec. 14, decided to recommend a new scheme of reduced gas charges by rebates graduated according to consumption beyond the first 10,000 c.ft. per half-year. These rebates, which will operate after the January meter readings, are as follows, the price of gas being 3s. 9d. per 1000 c.ft. for domestic use, and 3s. 2d. for trade purposes: From 10,000 to 100,000 c.ft., domestic rebate 5d., industrial 4d.; up to 250,000 c.ft., 7½d., 6d.; up to 500,000 c.ft., 10d., 8d.; up to 1,000,000 c.ft., 1s. 0½d., 10d.; and over 1,000,000 c.ft., 1s. 3d., 1s. The Bradford Gas Department have 20 consumers using over 1,000,000 c.ft. per half-year for domestic purposes, and a similar number for industrial uses above that figure per half-year.

Further Reduction in Price at Burnley.—The Burnley Corporation Gas Committee have reduced the price of gas to 7d. per therm, being the ordinary charge, with scale reductions to domestic consumers, or for power and heating purposes within and without the borough. This follows on a series of reductions during the past eighteen months from 8½d. per therm.

New Plant at Hereford.—Proposing the adoption of the report of the Gas Committee of the Hereford City Council recently, Alderman Witts stated that the contractors were making good progress with the erection of the new vertical installation, and they hoped to have it completed by next March. If this was the case, the Committee expected to be able to lower the price of gas early in the year.

Newport Reject Marsh Trustees' Offer.—At a meeting of the Marsh Trustees at Newport (Salop) on Dec. 11, a letter was read from the Newport Urban Council stating that they could not accept the Trustees' offer regarding the gas undertaking and works. In the "JOURNAL" for Aug. 22, p. 418, it was mentioned that, as the lease of the Newport Gas Company was shortly expiring, the Marsh Trustees were prepared, subject to the consent of the Charity Commissioners, to transfer to the Council, at any time before July 28, 1932, upon terms to be arranged, the interest of the Trustees in the Gas-Works. At the time it was remarked that the matter was one to which the Council should give early attention. The letter received by the Trustees, however, stated that the Council declined to meet them, and that the question of the Council's Parliamentary Bill was being referred to the Ministry of Health.

Opposition to Electric Street Lighting at Otley.—A substantial section of the ratepayers at Otley are strongly opposed to a recent decision of the Urban District Council, by a majority, to change over the street lighting from gas to electricity. The lighting of the streets has for some considerable time been admitted to be unsatisfactory, and the Gas Company, who were responsible only for supplying the gas, offered to take over the maintenance of the lamps for a short time to prove their argument that gas lighting is better for the streets than electricity. The Council did not accept the offer. There are suggestions that the Council have been rushed into this electricity decision; and that the electric lighting will be so costly as to add 2d. in the pound to the rates. Though the Council have opened negotiations with the Electrical Distribution of Yorkshire, Ltd., for a supply, there is talk in the town of a ratepayers' meeting to contest the decision.

Lecture on Gas Lighting at Warrington.—A lecture on gas lighting was given on Nov. 29 by Mr. F. J. Gould, the Chairman of the Bland Light Syndicate, Ltd., at the Demonstration Hall of the Mersey Street Works. There was a very good attendance, and Mr. Gould dealt fully with his subject, covering the progress of gas lighting from the 17th century up to the present day. He emphasized the benefits, often overlooked, to sight and general health from gas lighting, and stressed the necessity, at the present time, of watching the lighting load. He compared the old rule-of-thumb methods of calculating illumination values with the modern practice of adopting a table of working allowances in foot-candles, and gave a simple working formula as a guide. He then spoke of the necessity of giving publicity—not only in the local Press, but by other forms of advertisement—to the many advantages afforded to the householder by gas lighting. At the conclusion, Mr. A. Cook, the Engineer and Manager of the Warrington Gas Department, moved a vote of thanks to the lecturer, which was carried with acclamation.

When, at the Leicester Police Court on Dec. 10, Robert Dawson (16) was sent to a reformatory school for six months on a charge of theft, he admitted breaking into twenty houses and stealing money from gas meters.

At Wolverhampton Police Court recently, William Fitchew, the proprietor of a fish and chip shop of that town, was fined £5 for unlawfully fitting a tap and pipe on to the gas main on his premises, in order to obtain gas which had not previously passed through the meter.

At a Rotary Club luncheon on Dec. 11 at the Oriental Café, Sheffield, under the Chairmanship of Canon Spencer Elliott, Vicar of Mansfield, Mr. L. Orange, Principal of the Technical College, Mansfield, gave an address on the subject of coal and its future. He spoke hopefully of the ultimate success of the low-temperature carbonization and the pulverization of coal.

A verdict that death was caused by valvular disease of the heart, accelerated by gas poisoning, was returned by the jury at an inquest held by the Stoke City Coroner (Mr. W. M. Huntbach), at Longton Cottage Hospital recently, on Richard Fletcher, aged 64, gas distribution foreman, of Edensor, Longton. Fletcher was in charge of the work of repairing a gas main in Gold Street, Longton, and one of the bags, used to prevent the escape of gas when the pipe was cut, burst, and three men who were working in the excavation were overcome by the fumes. Mr. Fletcher, who had been superintending the work, subsequently died.

At the annual meeting of the Leeds Fireclay Company, Ltd., in Leeds recently, the President, Mr. C. F. Spencer, said that the Company were experimenting with smokeless fuel at one of the works. The principal product of the plant was household domestic fuel, and the bye-products were gas and oil fuel. In the various works controlled by the Company they used approximately 200,000 tons of coal a year, and they were making experiments to see how far they could utilize Plassman gases to supplant the raw coal now used. The fuel which was being produced was equal, or superior, to best house coal, and, though smokeless, made a bright fire.

STOCK MARKET REPORT.

CONDITIONS on the Stock Exchange last week were extremely quiet. There was a certain amount of activity following the New York slump, but this was confined to the shares favoured on the other side. British Funds retained their distinction of cheerfulness; but the indifferent traffic returns brought about renewed selling of Home Rail stocks. In the more speculative sections, things were noticeably subdued.

In the Gas Market, however, no complaints were heard. The feature of the week was the rise in Continental Union ordinary. Quoted the previous week at 37-40, the price on Friday rose 26½ points, to 55-75, on the Company's statement that there is to be a reorganization of capital. It is not possible to determine from the last published accounts whether this sensational rise is justified, but proprietors have been advised not to part with their holdings. Another announcement of interest is the decision of the Colombo Gas and Water Company to issue one bonus share for every four ordinary shares now held. This is a repetition of the procedure in 1925. Other variations included a rise of 8 points in the Portsmouth consolidated 4 p.ct. stock to 109-112—an improvement well justified, as on the dividend paid (7$\frac{4}{5}$ p.ct.) the yield on the new average price is over 7 p.ct.—and a recovery of 1s. in the Primitiva ordinary to 23s. to 25s.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 97¾, Bombay 21s. 1½d., British 117, Continental Union 39, 40, Gas Light and Coke 18s. 9d., 18s. 11¼d., 19s., 3½ p.ct. 63¼, 4 p.ct. pref. 80, 3 p.ct. deb. 60½, 5 p.ct. deb. 100½, Imperial Continental 167, Oriental 113½, Portsmouth 5 p.ct. 81, Primitiva 22s. 9d., 23s., 23s. 1½d., 4 p.ct. cons. deb. 80, South Metropolitan 107, 107¼, 107½, 107¾, 3 p.ct. deb. 60, 60¼, Tottenham "B" 102¼. Supplementary prices, Croydon 7½ p.ct. pref. 102, Gas Light and Coke 5 p.ct. deb 1952-57 100¼.

On Tuesday, Alliance and Dublin 98, 98$\frac{7}{16}$, Bristol 5 p.ct. 91, British 116, 117, Commercial 100, European 8⅛, Gas Light and Coke 18s. 9d., 18s. 11¼d., 19s., 3½ p.ct. 63¼, 4 p.ct. pref. 79, 79½, 3 p.ct. deb. 61, 61½, Liverpool 7 p.ct. pref. 102¾, Oriental 114, Primitiva 22s. 4½d., 22s. 7½d., 22s. 9d., 23s., South Metropolitan 107. Supplementary prices, Croydon 7½ p.ct. pref. 103.

On Wednesday, Bombay 21s. 6d., 22s., Colombo 43s., Colonial 24s. 6d., 25s., 8 p.ct. pref. 21s. 6d., 21s. 9d., 22s. 3d., Commercial 100½, Continental Union, 44, 45, Gas Light and Coke 18s. 9d., 18s. 10½d., 19s., 3½ p.ct. max. 63, 4 p.ct. pref 79½, 80, 3 p.ct. deb. 61½, Imperial Continental 168, 170, 3½ p.ct. deb. 67½, Lea Bridge 5 p.ct. 120, Newcastle 4 p.ct. pref. 71½, Primitiva 23s., 23s. 3d., South Metropolitan 107, Wandsworth, Wimbledon stock 112. Supplementary prices, Dover 7½ p.ct. max. 116½, Eastbourne "A" 123, Gas Light and Coke 5 p.ct. deb. 100, 100½, 100¾, 102½, Metropolitan (of Melbourne) 9½.

On Thursday, Bombay 21s. 9d., Brighton and Hove 6 p.ct. 117, 5 p.ct. 103½, 104, British 116½, 117½, 4 p.ct. deb. 74½, Continental Union 44, 45, 47½, 48, 48½, 50, European 8⅛, 8¼, Gas Light and Coke 18s. 9d., 18s. 10d., 18s. 11¼d., 19s., 3½ p.ct. max. 63¾, 4 p.ct. pref. 79½, 3 p.ct. deb. 60½, 61, Imperial Continental 168, 169, 3½ p.ct. deb. 68¼, Montevideo 96, Newcastle 4 p.ct. pref. 72, Primitiva 23s. 3d., 23s. 4d., 23s. 7½d., 23s. 9d., 24s., 4 p.ct. cons. deb. 79½, South Metropolitan 107¼, Tottenham "B" 102½, 103, Supplementary prices, Brighton and Hove 7 p.ct. deb. 104, Gas Light and Coke 5 p.ct. deb. 100¾, 102⅞, Reading 5 p.ct. max. 83, Sutton 119.

On Friday, Alliance and Dublin 98, 98⅝, Continental Union 51, 54½, 55, 56, 58, 60, Croydon sliding-scale 112, European 8½, 8¼, Gas Light and Coke 18s. 9d., 18s. 10½d., 18s. 11¼d., 19s., 3½ p.ct. max. 63¼, 4 p.ct. pref. 79½, 3 p.ct. deb. 59¾, 60½, Imperial Continental 168½, 169½, Lea Bridge 5 p.ct. 120, 120½, Montevideo 97, Portsmouth 4 p.ct. 110, Primitiva 24s. 3d., 24s. 4½d., South Metropolitan 107, 3 p.ct. deb. 60, South Suburban 5 p.ct. 109½, Tottenham "B" 102¼, 103. Supplementary prices, Bournemouth new 6 p.ct. pref. (issued at £11 5s., £6 5s. paid) £6 7s. 3d., Gas Light and Coke 5 p.ct. deb. 1952-57 100⅜, Liverpool 5 p.ct. 90⅝, Wakefield 5 p.ct. max. 71.

Money was in comfortable supply in Lombard Street. Balances were usable right up to the close at 3 p.ct., and both old and new loans were mostly arranged at this rate. The Treasury Bill allotment produced an average rate of £4 8s. 4·07d. p.ct., being 1s. 6·6d. p.ct. above that of the previous week; in fact, one has to go back to February, 1927, to find a higher rate. Discount rates were naturally promptly raised.

In the Foreign Exchange Market, quotations moved within narrow limits. The American rate improved to 4.85$\frac{13}{16}$; but European currencies show little change. Spanish pesetas appreciated to 29.86; but Italian lire at 92.65½, and Dutch florins at 12.07⅝, moved in favour of this country. French francs at 124½, Belgas at 34.89, and German marks at 20.35¼ were unchanged.

Silver was a little firmer on Chinese support at 26½d. per oz., and Gold was unaltered at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2⅝ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 14.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			% p.a	% p.a.				
171,978	Stk.	Aug. 30	5	5	Aldershot 5 p.c. max. C.	72—77	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	..
1,551,868	,,	Sept. 27	7	7½	Alliance & Dublin Ord.	96—99	..	97¼—98⅞
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	63—66	..	..
522,654	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	114—117	..	..
300,000	1	Oct 11	1/7½	1/8⅝	Bombay, Ltd.	20/—22/-	..	21/1½—22/-
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	19½—18½	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	19½—12¾	..	..
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11—11½	..	..
50,000	Stk.	July 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
357,900	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	117
341,880	,,	,,	6¾	6¾	Do. 5 p.c. Con.	101—104	..	103½—104
1,387,500	,,	July 26	5	5	Bristol 5 p.c. max.	92—93a	..	..
885,000	,,	Sept. 27	7	8	British Ord.	115—118	+1	116—117½
100,000	,,	June 28	7	7	Do. 7 p.c. Pref.	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	74—77	..	74½
300,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	95—98	..	..
100,000	10	Dec. 6	8	6	Cape Town, Ltd.	7⅞—8¼*	..	..
100,000	10	Oct 25	4½	4½	Do. 4½ p.c. Pref.	6¼—7½	..	..
150,000	Stk.	June 28	4½	4½	Do. 4½ p.c. Deb.	78—78	..	..
626,860	,,	July 26	6	6	Cardiff Con. Ord.	97—100	..	..
287,860	,,	June 28	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
157,150	,,	Aug. 16	6½	5	Chester 5 p.c. Ord.	88—93b	..	43/-
79,185	1	Oct. 11	12/-	12/-	Colombo Ltd. Ord.	41/—43/-	..	43/-
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	21-/—23/-	..	..
375,402	1	Oct. 11	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	24/6—25/-
187,845	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	21/6—22/8
3,073,280	Stk.	July 26	7	5	Commercial Ord.	98—101	..	100—100½
475,000	,,	June 14	8	8	Do 8 p.c. Deb.	57—60	..	..
800,000	,,	Sept. 27	11	11	Continental Union, Ltd.	55—75	+26½	39—60
300,000	,,	,,	7	7	Do. 7 p.c. Pref.	92—97	+2	..
787,560	,,	Aug. 16	7	7	Croydon sliding scale	110—113	..	112
403,100	,,	,,	5	5	Do. max. div.	84—87	..	..
492,270	,,	Aug. 16	10	7	Derby Con.	115—120e	..	..
55,000	,,	June 28	4	4	Do. Deb.	71—73e	..	..
909,000	,,	Aug. 30	5	5	East Hull Ord. 5 p.c.	75—78	..	..
1,002,180	10	Sept. 13	16	14	European, Ltd.	8 9	..	8⅛—8½
18,709,480	Stk.	July 26	5/1/1	5½	Gas Light & Coke 4 p.c. Ord.	18/7½—19/1½f	..	18/9—19/-
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	62½—64½	..	63—63⅝
4,157,030	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	79—80
5,809,630	,,	June 14	3	3	Do. 3 p.c. Con. Deb.	60—62	..	59⅝—61½
181,815	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	104—107	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	100—102	..	100½
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 30	6⅝	7	Hastings & St L. 5 p.c. Conv	95—100	..	..
268,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	75—80	..	..
70,000	10	Oct. 11	†10	†10	Hongkong & China, Ltd.	13 14	..	..
173,300	Stk.	Aug 30	5	5½	Hornsey Con. 5½ p.c.	88—91	..	..
1,976,000	,,	Nov. 8	10	10	Imperial Continental Cap.	167—170	..	167—170
223,130	,,	Aug 16	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	67½—68½
285,342	,,	Aug 16	7	7½	Lea Bridge 5 p.c. Ord.	116—121	+1	120—120½
2,145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord.	90½—91b	−½	..
600,000	,,	Sept 27	7	7	Do. 7 p.c. Red. Pref.	101—102b	..	..
165,736	,,	Aug. 16	8	9	Maidstone 5 p.c. Cap.	120—125	..	..
63,480	,,	June 14	3	3	Do. 3 p.c. Deb.	55—58	..	..
75,000	5	Dec. 6	†8	†8	Malta & Mediterranean	5½—5⅝*	..	..
541,930	Stk.	Nov. 22	†7	†5	Montevideo, Ltd.	96—97*	..	96—97
2,981,815	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	16/3—16/9df	..	..
860,929	,,	,,	4	4	Do. 4 p.c. Pref.	71½—72½d	..	..
691,705	,,	June 28	8½	8½	Do. 8½ p.c. Deb.	69½—70½d	..	..
131,780	,,	Aug 30	6/18/0	7/1/0	North Middlesex 5 p.c. Con.	102—107	..	..
300,000	,,	Nov. 22	7	9	Oriental, Ltd.	112—115*	..	113½—114
188,120	,,	June 28	7½	7½	Plym'th & Ston'house 5 p.c.	110—113	..	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	109—112	+8	110
236,782	,,	,,	5	5	Do. 5 p.c. max.	79—82	..	81
3,334,464	1	—	—	—	Primitiva Ord.	23/—25/-	+1/-	23/4½—24/4½
244,500	100	Dec. 8	4	4	Do. 4 p.c. Red. Deb.	91—94*	..	..
695,000	Stk.	July 26	4	4	Do. 4 p.c. Red. Deb. 1911	78—80	..	..
416,345	,,	June 28	4	4	Do. 4 p.c. Cons. Deb.	78—80	..	79½—80
150,000	10	Sept. 27	6	6	San Paulo 6 p.c. Pref.	8⅛—8⅝	..	..
270,000	Stk.	Aug. 30	6	6½	Sheffield A	104—105e	..	..
419,968	,,	,,	6	6½	Do. B	104—105e	..	..
1,047,000	,,	,,	6	6½	Do. C	104—105e	..	..
90,000	10	June 14	†3	†4	South African	4—6	..	..
6,809,895	Stk.	July 26	7½	5	South Met. Ord.	106½—108½	..	107—107½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	..
1,895,445	,,	July 12	8	8	Do. 8 p.c. Deb.	59—61	..	60—60½
784,000	,,	Sept 13	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Aug. 16	8½	8½	South Shields Con.	109—110d	..	..
1,243,795	,,	July 26	6½	6½	South Suburban Ord. 5 p.c.	108—111	..	109½
588,837	,,	June 28	5	5	Do. 5 p.c. Deb.	98—101	..	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max.	77—79	..	..
121,275	,,	June 28	4	4	Do. 4 p.c. Deb.	72—75	..	..
250,000	,,	Aug. 30	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	..
300,000	,,	June 28	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	..
120,000	,,	July 26	7½	8	Tottenham District A 5 p.c.	117—122	..	..
989,275	,,	,,	6½	6½	Do. B 5½ p.c. Pref.	100—103	..	102½—103
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	96—99	..	..
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75—78*	..	..
					Uxbridge, Maidenhead, &			
289,094	,,	Aug. 30	6⅞	6⅞	Wycombe 5 p.c.	93—98	..	..
98,330	,,	,,	5	5	Do. 5 p.c. pref.	87—92	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 12	8½	8½	Wandsworth A 5 p.c.	130—135	..	..
255,698	,,	,,	7	7½	Do. B 8½ p.c.	113—118	..	..
493,585	,,	,,	5/19/0	6⅛	Do. C and New	99—104	..	..
862,000	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	107—112	..	112
28,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	115—120	..	..
100,000	,,	,,	5	5	Do. 5 p.c. Pref	88—91	..	..
98,416	,,	June 28	3	3	Do. 3 p.c. Deb.	57—60	..	..
584,743	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	98—100	..	..

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Owing to the Christmas Holiday intervening, it will be necessary to go to press with the next number of the "JOURNAL" earlier than usual. All communications intended for this issue should reach us not later than the first post on Monday, Dec. 24.

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CONTENTS.

EDITORIAL NOTES.

Our Review, and Some Reflections . . . 839
Gathering Strength 839
The Disappointment of the Year 840
The Holborn Explosions—A Suggestion—Who is for Berlin?—Thermal Output and Therms per Ton 841
Good Coke Implies Cheap Gas—City and Guilds of London Institute—Castles and Gas-Works—The Beauty Spoilers—Falling Trades Union Membership—"F.B.I." and "Black Smoke" 842

Personal—
Presentation to Mr. P. S. Hoyte . . . 843
Murdoch Lodge No. 3480 843
Forthcoming Engagements 843
Institution of Gas Engineers' Education Scheme—Examinations in Gas Engineering and Gas Supply, 1929 843
Half-a-Century of Service 843
Explosion in Bloomsbury 844
British Industries Fair—Gas Industries Section 845
A Study of Comparative Costs of Gas Production in the Retort House. By E. W. Smith, D.Sc., F.I.C. 845
Moisture in Coal and Coke and Its Influence on the Carbonizing Process 848
The Rational Cleaning of Coal. By R. Lessing, Ph.D., F.I.C. 850
Yorkshire Junior Gas Association—
Discussion on Radiation from Gas Burners 854
Scottish Junior Gas Association (Western District)—
Street Lighting and Equipment. By Thomas M. Lappin 855
A "Kodak" at the Works. By S. Webster 856
Scottish Junior Gas Association (Eastern District) 857
Midland Junior Gas Association—
Demonstration of Complete Gas Analysis. By A. R. Myhill, A.I.C., and E. T. Pickering, B.Sc., A.I.C. 858
Wales and Monmouthshire Junior Gas Association—
Visit to the National Oil Refineries at Llandarcy 859
Oil. By R. B. Southall 859
New Gasholder at Irvine—Inspection and Inaugural Ceremony 860
American Gas Association Convention . . 860
Education for Responsibility 861

CORRESPONDENCE.

Mr. A. T. Gilbert's Address to the London Juniors 861

PARLIAMENTARY INTELLIGENCE.

House of Lords 861
House of Commons—
Gas Legislation 861
Gas Poisoning 861
Gas Special Orders 861

MISCELLANEOUS NEWS.

Aldershot's Proposed Area Extensions—Opposition by the Godalming Gas Company 862
Chapel and Whaley Bridge Gas Company—Annual Report 862
Stockport Corporation Apply for a Special Order—Board of Trade Inquiry 862
Gas Regulation Act Applications 864
Consumers' Gas Company of Toronto—An Eminently Satisfactory Year 864
Carbonization of Kent Coal—Suitability of Low-Temperature Treatment 864
Proposed Decrease in Price at Glasgow—Concession to Domestic Consumers . . 864
Diaries, Calendars, &c. 864
Trade Notes 864
Coal Trade Reports—
North-East Coast 865
Yorkshire and Lancashire 865
Midlands 865
Current Sales of Gas Products 866
Contracts Open 866
Stock Market Report 867

PARAGRAPHS.

World Engineering Congress in Japan, 1929—Institution of Heating and Ventilating Engineers 843
The "Practical Engineer" Mechanical Pocket Book and Diary 853
Cheaper Gas for Dewsbury—Reduced Charges—Skipton's Proposed Gasholder—Stand-by Plant for Rotherham 861
Opening of Inverness Plant Extension—A Question of Insurance 865

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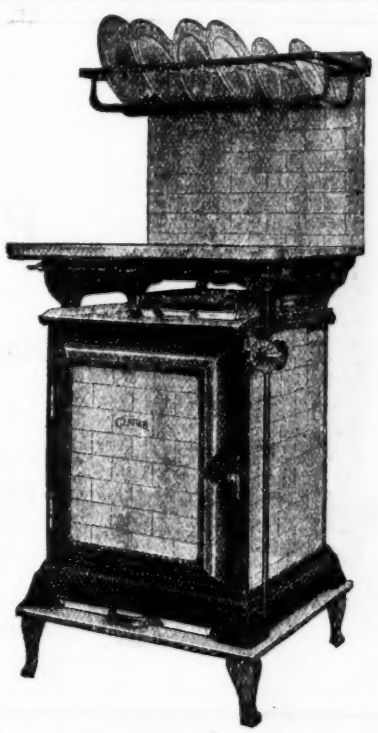

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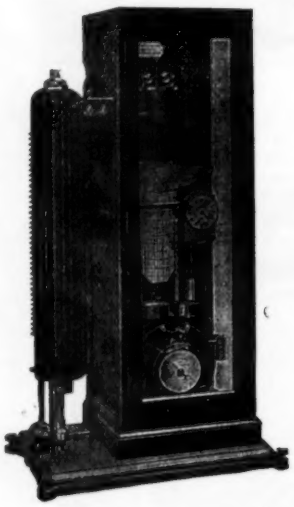

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